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NESCAUM Response to Comments by Thomas Morrissey, President, Woodstock Soapstone Company, Inc. *re:* NESCAUM report "Assessment of EPA's Residential Wood Heater Certification Program"

In March 2021, the Northeast States for Coordinated Air Use Management (NESCAUM) released the report "Assessment of EPA's Residential Wood Heater Certification Program"[1] detailing the results of a review of wood stove certification tests submitted by stove manufacturers to the U.S. Environmental Protection Agency (EPA). These tests are the basis for EPA's certification that new wood stoves and heaters sold after May 15, 2020 are meeting new source performance standards (NSPS) that limit the amount of air pollution the stoves can emit, as required under the federal Clean Air Act (CAA). Based on a review of the available test reports, NESCAUM concluded that the EPA NSPS certification program was systemically flawed and provided little confidence to state and local air agencies that new wood stoves and heaters installed within their jurisdictions were appreciably cleaner than older stoves and heaters. This is a concern to state and local air agencies because of the public health implications and the significant amount of public funding being used to incentivize installation of new wood burning devices that may be no cleaner than the previous older devices.

On May 21, 2021, Thomas Morrissey, President, Woodstock Soapstone Company, submitted via email a critique[2] of the NESCAUM report to the Alaska Department of Environmental Conservation (ADEC). While Mr. Morrissey has not submitted his comments directly to NESCAUM, NESCAUM is providing the following responses because the comments largely focus on NESCAUM's March 2021 report.

An overarching comment by Mr. Morrissey is that the NESCAUM report is biased and "aims explicitly to influence policy-makers" because NESCAUM is involved in developing an alternative test method in addition to, or in lieu of, current test methods. NESCAUM is a non-profit organization and has no proprietary interest in test methods. It is NESCAUM's stated mission "to provide technical and policy support to the air quality and climate programs of its member states."[3] During its over 50 years of existence, NESCAUM has performed technical assessments and provided policy recommendations on a wide range of air pollution and climate issues affecting the health and environment of people living in the Northeast, and these assessments and recommendations have at times helped support efforts in other states beyond the NESCAUM membership. In light of NESCAUM's mission, it has clear interests in evaluating the efficacy of the EPA wood device NSPS program and developing improved wood device test methods to better protect public health and ensure the effective use of tax payer dollars. This is done with the intent of enabling more informed decision-making by policymakers.

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[1] NESCAUM, "Assessment of EPA's Residential Wood Heater Certification Program," March 2021. Available at https://www.nescaum.org/documents/nescaum-review-of-epa-rwh-nsps-certification-program-rev-3-30-21.pdf.
[2] "Review (Part I) of Assessment of EPA's Residential Wood Heater Certification Program Test Report Review: Stoves & Central Heaters, Written by NESCAUM, March 2021," Review by T. Morrissey, President, Woodstock Soapstone Company, Inc. (May 15, 2021).
[3] *See* footnote 1 above, at p. iv. The NESCAUM members are the state air agencies in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

Portions of Mr. Morrissey's comments are excerpted below along with NESCAUM's responses to them. Mr. Morrissey's critique in its entirety and other supporting items to these responses are attached at the end of this document.

I. Footnotes 1 and 2 of the comments state: [footnote 1] *Sweeping claims of dysfunction, systemic failure, and cheating appear IMMEDIATELY in the "Assessment," first appearing on page iii, in The Summary for Policy Makers. A reader of the "Assessment" needs to be mindful that the document is essentially political in nature (i.e., it aims explicitly to influence policy-makers) and not a scientific inquiry, or a dispassionate review. The "Assessment" is a political diatribe that attempts to advance a specific agenda. The "Assessment" describes methods used to collect evidence that are subjective and not evidence based, and it arrives at conclusions that are often biased, subject to conflicts of interest, and unsupported by the facts.*

[footnote 2] *The "Assessment" is a "screening level analysis" ("Assessment" pg xiii; pg. 16). Data was apparently collected by individual reviewers, each filling out an Excel spreadsheet while reviewing individual test reports online. The decision to use data accumulated by individual reviewers (without cross-checking, verification or other quality control) was apparently based on just one event where three people reviewed the same report and came to similar conclusions:*

> *"To assess the review tool (i.e., spreadsheet) performance, three people reviewed the same report independently. A comparison of the three reviews found that all three reviewers identified the same flags. All three reports obtained the same preliminary review determination. Based on this effort's findings, the team agreed that the tool (i.e., spreadsheet) was sufficient to allow multiple people to complete test report reviews." ("Assessment," page 16)*

Quite remarkably, given the focus of the "Assessment", there appears to have been little quality control after this initial comparison of one report, by three people. The "Assessment", cites statistics from this "screening level analysis" as though they represent a thorough, objective, factual assessment of these reports, but there is scant evidence of thoroughness, objectivity, or quality control in collecting data for the "Assessment."

NESCAUM response: The asserted political nature of NESCAUM's report is addressed in the third paragraph of this response document. NESCAUM disagrees with the implicit premise that scientific inquiry and influencing policy are mutually exclusive, as scientific inquiry is the starting basis for much of what drives public health and environmental policy under the Clean Air Act.

NESCAUM also disagrees with the characterization of the report review process. NESCAUM's review of the test reports was completed at the request of its member states during a 2019 meeting that included reviewing data on eight stoves. NESCAUM subsequently collaborated with ADEC and other agencies to include more stove reviews. The format of the review was derived from a process developed by Brookhaven National Laboratory for a previous review of test reports conducted under EPA's Voluntary Hydronic Heater Program. NESCAUM and

ADEC conferred extensively with federal, state, and local programs before undertaking the review, and the subsequent process included a committee made up of staff from five different air agencies to provide additional input as the reviews were underway.

The ADEC summary sheets, and by extension the NESCAUM Assessment, are based entirely on whether the test reports met the requirements or intent of the Residential Wood Heater New Source Performance Standards (NSPS), regardless of the test method used. Key to the review process was ensuring that each report was reviewed for the same elements as consistently as possible. As detailed in Section 3 of the Assessment, the review is clearly portrayed as a "screening level" analysis with the goal of determining if test reports required further scrutiny by EPA. The group reviewed almost 250 reports and made significant efforts to maintain consistency. As detailed in the Assessment, each report was initially reviewed by a single reviewer. The summary of those reviews were provided to a committee representing five different air agencies. As new issues and regulatory requirements were identified, all reports underwent additional review. Therefore, a subsequent reviewer may have objectively flagged subsequent elements differently from the original reviewer.

Since September 1, 2020, ADEC has given access to manufacturers to review and identify errors in the summary sheets as part of the review process. Based on this feedback, ADEC reviews and revises, when warranted, its summary sheets and releases updates on a monthly basis. The NESCAUM Assessment analyzed data at a point when manufacturers had more than five months to review and identify erroneous information. To the extent a manufacturer felt reviews were in error, it has had the opportunity to provide that information during the period covered by NESCAUM's Assessment.

NESCAUM notes that EPA, as part of its own review process, has developed a separate deficiencies list (*see* https://www.epa.gov/sites/production/files/2021-04/documents/epa_wood_heat_test_report_corrective_action_list_v1_rev1_apr_15_2021.pdf). EPA's list includes 37 of the 40 elements in the list used for the NESCAUM Assessment, and added an additional 12 items not contained in the Assessment.

NESCAUM also notes that on February 3, 2021, more than a month before the release of the NESCAUM report, EPA sent letters to testing labs and third-party certifiers stating EPA was conducting its own review of the test reports. In that letter, EPA stated, "To date we have seen sufficient information to anticipate a number of major findings." The letter also stated that EPA will notify ADEC if the EPA reviews contradict the findings of the ADEC summary sheets used in NESCAUM's Assessment. It is NESCAUM's understanding that EPA has reviewed approximately 50% of the cordwood stove reports, and as of June 1, 2021 neither ADEC nor NESCAUM have been notified of deviations.

II. *The "Assessment" is intended to influence "policymakers" by claiming 1) that the EPA Certification Program is dysfunctional and a systemic failure,* [footnote1 in item I above] *2) that there are a significant number of discrepancies and omissions in test reports submitted to EPA for approval,* [footnote 2 in item I above] *3) that EPA has failed to conduct compliance audits,*

[footnote omitted] *and 4) that the NESCAUM and ADEC could do a better job than EPA in, a) determining which stoves are in fact the cleanest burning and, b) developing a test method for certifying wood burning appliances. NESCAUM has provided scant data to back up these major claims, and some of the data that it does present is riddled with discrepancies, omissions, bias errors, and conflict of interest, as detailed below. Bias is evident everywhere; in tone and use of language, in lack of transparency, in the selection of subjective criteria to attempt to discredit test methods and results, and in its attempt to advance NESCAUM's own agenda* [footnote omitted] *with its "policy recommendations." The bias is so pervasive that it undermines much of the "Assessment."*

NESCAUM's responses are given below in the order listed of issues raised in the above comment::

1. *Dysfunctional and a systemic failure*: At the very foundation of the 2015 Residential Wood Heater rule is transparency and public access to test reports. One of the requirements for a manufacturer to obtain an appliance certification is that, "the manufacturer will place a test report and summary on the manufacturer's website available to the public within 30 days after the Administrator issues a certificate of compliance." The reviewers used the definition of a valid certification test to determine if the posted report was complete. The ADEC/NESCAUM reviews could not find a single complete report. Issues were found across all appliances and test methods. More than a year later, there are still test reports for which EPA cannot give a link to NESCAUM or ADEC to review the report. Furthermore, EPA in its February 3, 2021 letters sent to testing labs and third-party certifiers characterized the test review findings as revealing "serious and systematic problems to be addressed in the testing and third-party certification processes."

2. *There are a significant number of discrepancies and omissions in test reports submitted to EPA for approval:* The review identified numerous instances where submitted test reports contained data elements that did not match manufacturer marketing materials and actual measurements of fireboxes where available. There were also numerous and clear instances of missing data elements in the reports. These are clearly documented in the report reviews.

3. *EPA failed to conduct compliance audits*: Mr. Morrissey is blending third-party or EPA inspections of the manufacturing process under 40 CFR 60.533(m) of the NSPS regulation with compliance audits of individual models under 40 CFR 60.533(n). The NESCAUM Assessment did not identify manufacturing process audits under 60.533(m) as an issue. NESCAUM's Assessment focused solely on compliance audits of a device's emissions performance under 60.533(n) that are intended to replicate certification testing as part of EPA's oversight duty. The Assessment recommends that EPA conduct compliance audits of randomly selected models under 60.533(n) to address concerns about program integrity. As noted in the Assessment, EPA has not performed such an audit in over 30 years of the NSPS program.

4. *NESCAUM/ADEC could do a better job than EPA:* Neither NESCAUM nor ADEC have any desire to assume the federal government's role. It is the responsibility, however, of air agencies to protect public health from the harms of air pollution, and where EPA action is insufficient, to attempt to fill the void. Notwithstanding this responsibility, state, local, and tribal agency resources are resource-constrained, and many agencies rely on the federal NSPS program for enforcing compliance with all rule requirements and ensuring that installation of new appliances will improve air quality. Furthermore, the basis for receiving taxpayer dollars in the form of incentives, rebates, or tax credits relies on the integrity of the certification testing program. As indicated in the recommendations, the NESCAUM Assessment calls upon EPA to address the identified shortcomings of the NSPS program. To the extent EPA does not, then it is left to the state, local, and tribal agencies to act.

III. *The "Assessment" contains a disclaimer which states "NYSERDA, the States of Alaska and New York, and NESCAUM make no warranties or representations, express or implied, as to the fitness for a particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report." ("Assessment," Page iv, emphasis added). The authors of the "Assessment" make both express and implied representations about the "usefulness, completeness and accuracy" about EPA's test review processes, their own review process, and multiple test methods. They cannot disclaim what they explicitly set out to do. Failure to review their own claims and representations – in this case their disclaimer – is a recurring feature of the "Assessment", from beginning to end.*

NESCAUM response: Mr. Morrissey confuses boilerplate "legalese" provided by agencies to prevent commercial endorsements of products or services with a broader asserted disclaimer of the Assessment's internal scientific methods used to develop its results and recommendations. The disclaimer is standard language to indicate that any mention of a product, service, process, method, etc. should not be taken as an endorsement of those products, services, etc., offered in the marketplace. It is not a disclaimer of the Assessment's own scientific methods and results, and NESCAUM fully stands behind them.

IV. *In addition to the "Assessment" of on-line woodstove test results, NESCAUM has developed its own entirely new woodstove test protocol called Integrated Duty-Cycle Test Method (IDCTM), along with a new method of measuring woodstove emissions using a Tapered Element Oscillating Measurement device (TEOM).* [footnote omitted] *Changing two major variables in certification test procedure (the actual test procedure from the current method(s) to the IDCTM and the method of collecting particulates from the dilution tunnel method to TEOM) is a violation of the principle of "vary-one-thing-at-a-time" (VOTAT). The result of changing two major variables at the same time might well produce a tangle of results requiring significant time and effort to tease apart.*

The New York State Energy Research and Development Authority (NYSERDA) funded NESCAUM's development of the IDCTM, and NYSERDA owns [footnote omitted] *this new, unused method. ADEC adopted the IDCTM test method as the only approved cordwood test method in Alaska, notwithstanding that it has never been used for certification testing of a single stove. Alice Edwards of ADEC applied to EPA for approval of this method as a broadly applicable alternative test method, for use in testing new wood stoves, and her request was approved on 4/9/21. [...]*

The only other approved cordwood test method is ASTM E-3053 [...] which was approved by EPA on February 28, 2018 (over 3 years ago). The ASTM E-3053 method has been used to test 85 of approximately 148 wood stoves currently on the EPA certified list, or 57% of all approved stoves. The 85 stoves approved using the ASTM E-3053 method have generated at least 255 fully documented data sets for individual test runs. The IDCTM method, developed by NESCAUM, owned by NYCERDA [sic] *and adopted by ADEC has yet to be used even one time.*

NESCAUM response: NESCAUM disagrees with Mr. Morrissey's implicit assertion that the primary intent of the NESCAUM Assessment is to promote the IDC method. As previously indicated, NESCAUM undertakes technical assessments to assist air agencies in having better information for making public health and resource allocation decisions. Mr. Morrissey's statement that "The ASTM E-3053 method has been used to test 85 of approximately 148 wood stoves currently on the EPA certified list, or 57% of all approved stoves" underscores why ADEC, NESCAUM, and other air agencies have concerns with the test method and EPA's oversight of compliance with test requirements. Assuming Mr. Morrissey's numbers are correct, they demonstrate ASTM 3053 is widely used, therefore problems with the test method can have large impacts.

While the IDC is not a focus of the NESCAUM Assessment, NESCAUM is responding to the IDC assertion because it is raised by Mr. Morrissey. NESCAUM notes that EPA has already indicated that it would be seeking an alternative to ASTM 3053 because of issues raised with it at a January 15, 2020 stakeholder roundtable discussion with EPA. Later in 2020, EPA publicly posted information on its effort to use data from the IDC approach as the basis for replacement test methods.[4] EPA's decision regarding the use of IDC was made more than a year before the release of the NESCAUM report. The IDC test method report is publicly posted and provides supporting publicly available data for EPA to assess in reviewing the method.[5] NESCAUM is not aware of any similar amount of data being provided to EPA prior to its approval of ASTM 3053.

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[4] U.S. EPA, Cord Wood and Crib Wood Testing, https://www.epa.gov/burnwise/cord-wood-and-crib-wood-testing.

[5] NYSERDA, 21-02 Interim Report: Development of an Integrated Duty-Cycle Test Method for Cordwood Stove (December 2020). Available at https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/21-02-Interim-Report-Development-of-Integrated-Duty-Cycle-Test-Method-Cordwood-Stove.pdf. *See also*, S. Johnson, U.S. EPA, letter to A. Edwards, April 9, 2021. Available at https://www.epa.gov/sites/production/files/2021-04/documents/atm_140_rev4_april_9_2021_signed.pdf.

NESCAUM also notes that until recently, EPA has not had the resources to investigate and develop other test methods, but this has recently changed. Currently, EPA is conducting its own work to validate both the TEOM and IDC protocols. These efforts are part of an EPA research effort that is separate from the NESCAUM Assessment. EPA recently released its Quality Assurance Program Plan as part of this effort.[6]

NESCAUM recognizes that the move to IDC test methods is a paradigm shift. To support that shift, NESCAUM has provided at no charge TEOMs to three certified labs and interested manufacturers, including Mr. Morrissey's company. For those companies, NESCAUM has attempted to support their efforts and increase technical capacity about the new technologies and protocols, including providing individual responses to questions and conducting webinar presentations on the IDC.

ADEC's request to EPA for approval of the IDC test method as an Alternative Test Method (ATM) stemmed from the reference to the method in ADEC's state rule, which is part of its State Implementation Plan that must be accepted by EPA. The ADEC rule supports efforts to keep cordwood heating appliances as an option in its particulate matter non-attainment area.

With regard to NYSERDA's ownership of the IDC test method, NESCAUM notes that while the test copyright and intellectual property belong to NYSERDA, it has granted unlimited use and distribution at no cost to any entity that wishes to use the method for research or certification purposes. ASTM 3053, which is also held as intellectual property, requires payment to ASTM for its use and distribution.[7]

V. *On its website, ADEC specifically says that it has not approved any stove tested with the ASTM E-3053 Method, and further states that it anticipates removing stoves approved by EPA using the ASTM E-3053 it from its own, state-approved woodstove list. The "Assessment" states:*

> ***5.2.4 Improving Certification Test Methods***
> *Current cordwood test methods used to certify residential wood heaters are poorly designed and often lack the specificity to ensure viable and comparable emission results.* ***EPA should revoke or modify problematic test methods. The ASTM 3053 test should be revoked as a Broadly Applicable Test Method****...("Assessment," page 70, emphasis added)*

The "Assessment" is critical of the ASTM E-3053 method. However, most of the criticisms are based on subjective, and often completely false, characterizations of this method.

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[6] U.S. EPA, QAPP for Support Development of Test Methods for Residential Cordwood; version 0, March 31, 2021. Available at https://www.regulations.gov/document/EPA-HQ-OAR-2016-0130-0019.

[7] ASTM E3053-18e1, Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel, ASTM International, West Conshohocken, PA, 2018, www.astm.org; DOI: 10.1520/E3053-18E01 (available at https://www.astm.org/Standards/E3053.htm).

Much of the NESCAUM/ADEC criticism of this method is related to fueling protocols [footnote omitted] *used for testing. Specifically, NESCAUM/ADEC allege widespread "doctoring" of cordwood fuel by "debarking" the fuel, and "squaring" cordwood pieces before testing. Additional criticism is directed toward how the firebox volume is calculated, whether such calculations are consistent with owners' manuals, whether the length of the cordwood fuel for testing was correctly calculated, and whether the fuel was loaded in the correct direction.*

An additional criticism was whether or not the medium burn rate in the test results corresponded to a rate preferred by the ADEC reviewers, but not required by the test.

In order to assess NESCAUM/ADEC's data analysis and conclusions, we need to first look carefully at its data collection methods and ask whether the underlying data is complete, credible, and unbiased. The main focus of this Part One of A Review of the "Assessment" is on how data was collected and tallied on "Summary Review Sheets" by ADEC.

On the following pages I raise concerns about quality control, bias, and conflict of interest in NESCAUM/ADEC's acquisition of data. It is clear that NESCAUM/ADEC reviewers lacked objectivity in assessing information, particularly with regards to the ASTM E-3053 method, and they reviewed individual test reports (knowingly or not) with the intent to discredit the ASTM E-3053 and advance their own interest in promoting the IDCTM method.

NESCAUM response: NESCAUM disagrees with the overall comment that the Assessment is based on "subjective, and often completely false, characterizations of [the ASTM] method." While at no location in the text of the NESCAUM Assessment does Mr. Morrissey's quoted word "doctoring" appear, NESCAUM does believe that the test method as put into practice allows a wide range of manipulation that diverges too much from common in-home use. The result is a test method that is difficult to reproduce and fails to provide reasonable assurance of a certified stove's in-use performance.[8]

NESCAUM's recommendation to revoke ASTM 3053 stems from a comparative review of testing data and method comparison identified as part of its regulatory review and test method development efforts. The identified issues with ASTM 3053 reflect problems with ASTM 3053 standing on its own, and is independent of IDC or any other test method. The issues are based on clear criteria listed in the test report review template and consistently applied, as documented in the NESCAUM Assessment. NESCAUM also notes that under ADEC regulations, use of an Alternative Test Method requires ADEC's review and approval. For units already certified,

[8] NESCAUM notes that the potential for test method manipulation has previously been raised by a testing lab. In 2006, Rick Curkeet, then at Intertek, a wood stove testing lab, sent an email to U.S. EPA OECA and OAQPS staff stating, "There are EPA accredited labs who offer design services, perhaps guarantee passing results, witness tests at manufacturer's labs, offer lower costs, and manipulate the test parameters to the manufacturer's advantage. This makes us 'uncompetitive' anyway. (We no longer do any significant EPA NSPS Woodstove certification testing due to these practices.)" In a second email, Mr. Curkeet stated, "… Intertek has had a very small fraction of the wood stove EPA certification test market. This is not because we are too expensive, its [sic] because we have refused to offer design services or manipulate the test process to our clients [sic] advantage, while our competitors have done just that."

ADEC did not dismiss them for any single identified test issue, but rather on the cumulative basis of multiple issues identified by a test report review.

As the NESCAUM Assessment points out, some of the test review items were developed to flag issues that are not clearly prohibited under the test method. NESCAUM's Assessments identifies these as potential areas where testing can be manipulated due to lack of clarity and definitions in ASTM 3053, and therefore can undermine the intent of the NSPS rule.

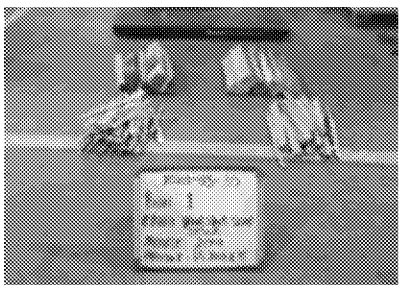
1) Squared cordwood pieces

   ASTM 3053 defines cordwood as "typically round wood that has been split into triangular, half-round, quarter-round, wedge-shaped or trapezoidal segments." The method itself defines cordwood and does not include a square in the definition. It is our understanding the EPA has concurred with the report review that ASTM 3053 does not allow the use of squared wood, as that essentially turns the cordwood test into a cribwood test. EPA, in its deficiencies list, has concurred with this element.

   Per the ADEC review process, any single run that has been identified as using 50% or more squared pieces raises a flag. As part of this response, NESCAUM reviewed the test report in question by Mr. Morrisey, the Woodstock Soapstone Palladian. The picture below from run 2.1 appears to use primarily squared wood. Photos from run 1.1 also raise questions, but the lack of picture clarity created difficulties in making a clear determination.

   It is our understanding that ADEC provided Mr. Morrisey with the summary sheet for the Palladian in September 2020, and in his subsequent emails and letters to ADEC, this issue was not presented to ADEC for reconsideration prior to these latest comments. We encourage Mr. Morrisey to submit a complete list of issues he believes are incorrectly flagged for his reports to ADEC.

   Fuel Load Run 1.1 Woodstock Soapstone Palladian



Fuel load Run 2.1 Woodstock Soapstone Palladian

2) Debarking cordwood pieces

Mr. Morrissey is correct that ASTM 3053 allows debarking of the wood fuel, and the NESCAUM Assessment does not list debarking in and of itself as an element that should trigger the revocation elements of the NSPS. The NESCAUM Assessment developed a debarking audit criterion to identify test method issues that are technically allowed under the rule but not reflective of the intent. The text of the NSPS states, "*Cord wood is a different specified configuration and quality of wood that more closely resembles what a typical homeowner would use. Cord wood testing is a better measure of how the heaters will perform on the type of fuel commonly used in homes.*" As described in the NESCAUM Assessment, 50% debarking (*not* 100% debarking) was listed as an item that would trigger a recommendation for compliance audit testing, as it suggests testing under atypical conditions because significant debarking of cord wood is not a common homeowner in-use practice. NESCAUM's criterion is consistent with interpreting the NSPS rule intent. The Assessment recommends that EPA conduct audit testing on appliances to ensure appliances can comply with cordwood emission standards when burning wood with bark under typical in-use conditions.

This is an important criterion for NESCAUM because a literature review indicates that removing bark lowers measured emissions, making it more akin to dimensional lumber than cordwood.[9] As such, debarking beyond what is typically used by homeowners can allow for artificial manipulation of the test method.

In the NESCAUM Assessment, reviewers applied a debarking criterion to assess if any one run (not every run of the entire test) used 50% or more of debarked wood. If

[9] Nosek, R., Holubcik, M., and Jandacka, J. (2016) The impact of bark content of wood biomass on biofuel properties, *BioResources* 11(1), 44-53.

Holubcik, M., *et al.* (2017) Scientific Letters of the University of Zilina, 19, 94-100.

Tissari, J., *et al.* (2019) Fine Particle Emissions from Sauna Stoves: Effects of Combustion Appliance and Fuel, and Implications for the Finnish Emission Inventory, *Atmosphere* 10, 775, https://doi.org/10.3390/atmos10120775.

photo evidence indicated 50% or more of debarked wood, it was flagged for a possible recommendation for audit testing. In Mr. Morrissey's comments, he provides a number of photographs of wood fuel piles used in testing, and points to the use of barked pieces. As noted previously, the NESCAUM Assessment criterion for debarking was 50% or more for any single run. The provided photos are consistent with being flagged under the Assessment's 50% or more debarking criterion. For example, on page 14 of Mr. Morrissey's critique, adjacent to cord wood piles where he points out as having bark, there are comparable piles of cord wood in shape, size, and amount with no evidence of bark.

3) Fuel length

Unlike the federal reference method for wood stoves that requires a fuel length calculation based on the longest firebox dimension, ASTM 3053 does not specify how to calculate the nominal fuel length. The method gives the manufacturer discretion to determine the fuel length used for certification testing, thereby allowing the manufacturer to test with shorter fuel lengths that optimize emissions performance but may not reflect the manufacturer's information or representative conditions during common in-home use. NSPS testing should conform to EPA's Stack Testing Guidance, which states that "*tests be conducted under representative operating conditions.*" Because EPA does not provide clear direction on what constitutes representative testing for ASTM 3053 testing, the review team developed two metrics to assess fuel length: (1) the 5/6 rule used for M28R and (2) the maximum length recommended by the manufacturer in its owner's manual or marketing materials (website or brochure). This approach aligns with EPA's Stack Testing Guidance and was applied consistently according to available test report data.

4) The direction in which the cord wood pieces are loaded

Fuel loading configuration is an important factor in stove emissions performance. ASTM 3053 requires a photograph or video of test fuel load after it is placed in the firebox, which is one of eight photo requirements per test run. Mr. Morrissey argues that the NESCAUM Assessment reviews of the photographs are subjective. NESCAUM disagrees. The reviews are based on the clarity of the photographs in demonstrating that the lab complied with the intent of the photo requirements.

Below is an example photograph from a Woodstock Soapstone's certification test report. It objectively does not show the fuel load configuration. If reviewers could not ascertain details about loading direction, they were directed to flag the report as unable to determine rather than attempt to subjectively infer a configuration.

For many of the test reports, making this determination was straightforward. For comparison to the Woodstock Soapstone photograph, photographs from other test reports are shown following the Woodstock Soapstone photo to demonstrate the ability of most test labs to provide photos that clearly identify loading patterns and fuel piece placement.

Photo after loading Woodstock Soapstone Certification Test

Photo after loading SBI
Certification Test

Photo after loading HHT
certification test

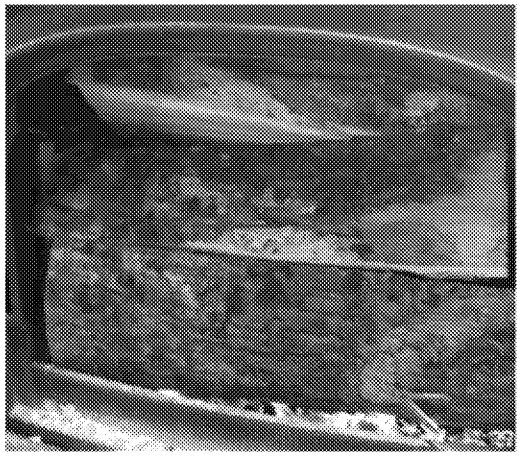


Photo after loading Travis Test

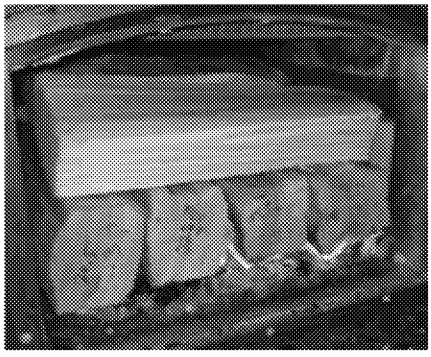
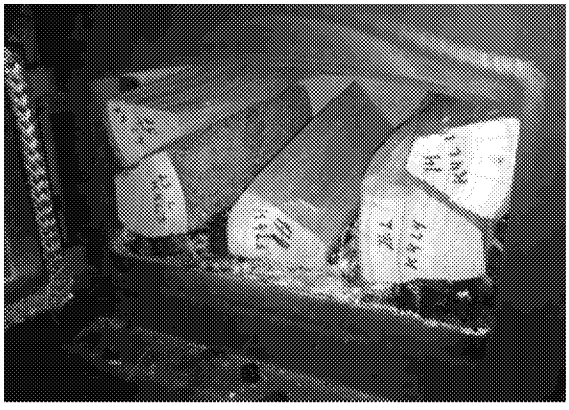
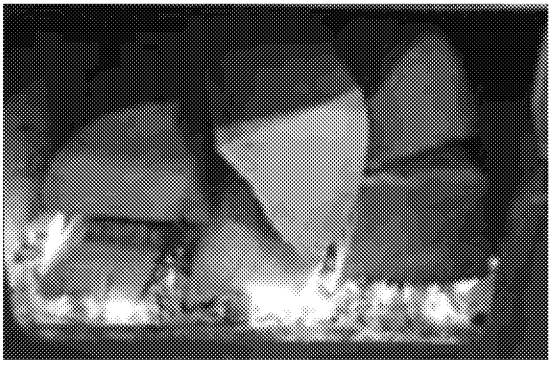


Photo after loading Kuma
certification test



Run 5 Test Fuel Loaded

Photo after loading Englander test



5) Whether manufacturers used the full firebox volume to calculate fuel volumes

ASTM 3053 allows the manufacturer to determine the firebox dimensions in its written instructions. This practice deviates from the requirements in Method 28R, which requires the use of the full firebox volume. Firebox volume is a critical component in determining the amount of fuel used in certification testing. The ASTM 3053 allowance for manufacturer instructions to determine the firebox size provides broad flexibility for a manufacturer to define a different firebox volume than physically exists. Of the ten Step 2 cordwood stoves certified using ASTM 3053 in NESCAUM's research program, eight had measured firebox dimensions that differed from their certification reports. Additionally, reviewers catalogued marketing materials that contain numerous examples where the firebox volume listed in product materials differed from the firebox volume used for certification testing. This analysis was not based on opinion, rather it was calculated from data.

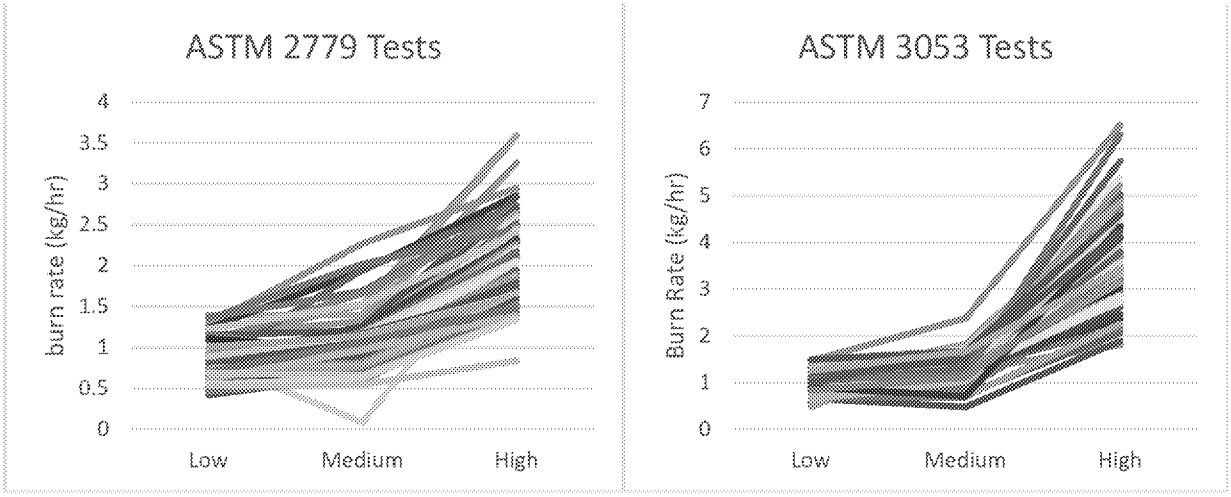
6) A burn rate differential of less than 0.30 kg/hr between the low and medium burns as non-representative of common use

ASTM 3053 lacks sufficient detail to determine how to apply low and medium burn conditions. EPA uses 0.45 kg/hr as the range for a single burn rate in M28R. In developing a criterion to better define medium burn conditions during common use for the NESCAUM Assessment, the reviewers decided to use a tighter parameter of 0.30 kg/hr – 50% less than EPA's range for a single burn rate – to determine if the burn rate for the medium setting given in the test reports was reasonable and to assess if the three burn rates appropriately characterized a range of conditions. Even with this parameter, review of certification test reports found some certification tests reported lower burn rates with medium air settings than with low air settings. Other tests used medium air settings for low burn test results, while using the low air setting for the medium burn rate.

Reviewers also compared low, medium, and high burn rates used in ASTM 3053 tests for cordwood stoves with the burn rates used in pellet stoves tested with ASTM 2779, which also uses a low, medium, and high setting. The NESCAUM Assessment detailed this information and, based on the data, determined that the medium burn settings given in the cordwood test reports were typically not reflective of a medium burn setting. The figures below show that the relationship between low, medium, and high settings in pellet stoves is fairly linear as burn rates increase from low to medium to high. However, this linear rise across burn rates is not seen in the ASTM 3053 cordwood test reports. Instead, the low and medium burn rates appear comparable, as seen with a near horizontal line, or even a dip, before increasing for the high burn rate. While ASTM 3053 may allow this practice, reviewers for the NESCAUM Assessment determined that it should be flagged for audit criteria because EPA's metric for certification is an emission rate given as mass over time (g/hr). In the ASTM 3053 method, lowering the burn rate to the lowest possible setting extends the burn time, which allows for a larger time period to average emissions over during the test run. By not having clear distinctions between burn rates, a test method can artificially extend the test time under low emissions. Therefore, it is to the manufacturer's advantage to employ atypically long burn practices during certification testing. This will result in a lower measured emission rate when

averaged over the full test time than would be seen during common in-home use because homeowners typically refuel more frequently.

Test Report Analysis of Low, Medium, and High Burn Rates in Pellet Stoves Using ASTM 2779 and Cordwood Stoves Using ASTM 3053



A review of ASTM 3053 test reports suggests individual test runs last significantly longer under this method in comparison to a similar M28R test. While some of the extended testing time may be a result of a larger fuel load used in ASTM 3053 than M28R testing, fuel load volume alone cannot explain test runs lasting two to three times longer than under M28R.

VI. *NESCAUM also recommends in its "Assessment" a federal policy which would require that any stove qualifying for the 26% Federal Tax Credit should have NESCAUM/ADEC approval as a qualification for the tax credit. The "Assessment" states:*

> ***5.2.3 Targeting Public Funding to Cleanest Appliances***
> *"Taxpayer-supported incentive programs, such as the 26 percent federal tax credit created under the BTU Act, EPA Targeted Airshed grants, and state supported activities should only apply to those appliances included on the list of approved models developed by the Alaska Department of Environmental Conservation. This is currently the only thorough review of certification test reports applying the 2015 RWH NSPS requirements. ("Assessment," page 70)*

In effect, the triumvirate of NESCAUM/ADEC/NYSERDA want to create a "super EPA" to supplant the existing federal EPA for the testing and certifying woodstoves.

The "Assessment" proposes that if New Hampshire residents, or residents of any of the other lower 48 states, wish to purchase low-emitting, high efficiency stoves from my New Hampshire factory, these stoves would have to be approved by EPA ***and*** *ADEC. Woodstock Soapstone Company would have to comply with the Alaska regulatory scheme (which currently only*

recognizes the NYSERDA ICDTM test method and the unproven TEOM measuring devices). The "Assessment" proposes that buyers should be punished (by being excluded from the federal 26% tax rebate) unless they buy stoves tested with the new IDCTM method. Currently there are no such tested stoves.

The triumvirate (NESCAUM/ADEC/NYSERDA) would use the Alaska regulatory scheme to coerce manufacturers to use their test method, because they propose to revoke the current cordwood method, and replace it with their own method. In this way, the "Assessment" is breathtakingly arrogant, hubristic, and self-serving. The conceit of the "Assessment" is risible.

NESCAUM Response: As part of Alaska's particulate matter attainment strategy, regulations for the Fairbanks non-attainment area require that all devices more than 25 years old be changed out. If these change-outs do not obtain emission reductions, Alaska's ability to maintain cordwood heating as an option may be compromised. Therefore, a key to the underpinning of Alaska's approved appliance wood stove list is that taxpayer-funded change-outs obtain needed emission reductions, as required under Alaska's regulations.

For other state and local agencies, this item is provided as a recommendation. Recent studies suggest that change-outs may not improve air quality and in some cases may actually worsen it.[10] It is fiscally prudent for state and local agencies to evaluate the basis for spending taxpayer dollars so that they achieve the desired results. As detailed in the NESCAUM Assessment, review of the data indicates that the lack of appropriate definitions and requirements make this method inappropriate for identifying clean appliances.

VII. *All ADEC data sheets that I have reviewed are undated and unsigned. Most have few, if any comments. Many have unfilled spreadsheet boxes (data not collected). All of the ADEC reports of stoves made by Woodstock Soapstone Company have serious omissions, errors of fact, misreporting, and untrue statements. Of six Woodstock Soapstone Company models approved to the EPA 2020 Standards, two models were missing entirely, and one model was reviewed twice, on separate data sheets that were inconsistent and did not match (i.e., different reviewers looking at the same data, or the same reviewer on different dates looking at the same data). The fact that ADEC reviewed the same data twice, and the two completed spreadsheets are markedly different, speaks to the concern (also noted in footnote #2) about quality control.*

NESCAUM response: Mr. Morrissey's belief that boxes that should have been filled were left empty is not correct. In the review process, it was at the discretion of the reviewer to provide

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[10] Ward T.J., Palmer, C.P., and Noonan, C.W. (2010) Fine Particulate Matter Source Apportionment Following a Large Woodstove Changeout Program in Libby, Montana, *Journal of the Air & Waste Management Association* 60:688-693, doi:10.3155/1047-3289.60.6.688. 28.
Noonan, C.W., et al. (2012) Residential indoor PM2.5 in wood stove homes: follow-up of the Libby changeout program, *Indoor Air* 22, 492-500, https://doi.org/10.1111/j.1600-0668.2012.00789.x.
Allen, R.W., Leckie, S., Millar, G., and Brauer, M. (2009) The impact of wood stove technology upgrades on indoor residential air quality, *Atmospheric Environment* 43, 5908-5915, https://doi.org/10.1016/j.atmosenv.2009.08.016.
Pinna Sustainability Inc., *BC Wood Stove Exchange Program: Program Evaluation 2008 to 2014*, Final Report (August 18, 2015), available at https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/wsep_evaluation.pdf.

notes on the report reviews in the final column. Where empty boxes exist, there was no reviewer comment, consistent with the use of reviewer discretion.

Similarly, with regard to Mr. Morrissey's comment that summary sheets were unsigned and not dated, this was not required by ADEC as part of the review process. As stated earlier, most test reports underwent multiple reviews by individuals and the review committee. The belief that the lack of signature or dates voids the data appears to be an opinion of Mr. Morrissey rather than a requirement for the ADEC process.

Mr. Morrisey's comment that only a select number of Soapstone appliances was reviewed is also not correct. As shown in the figure below taken from the EPA Wood Heater Database (https://cfpub.epa.gov/oarweb/woodstove/index.cfm?fuseaction=app.search) on May 24, 2021, there are seven Woodstock Soapstone appliances listed on the EPA website rather than the six Mr. Morrissey details in his statement. Of the seven appliances listed, six have been reviewed and have summary sheets on the ADEC website. The seventh appliance is a wood/coal stove. This type of stove is not allowed to be sold in the Fairbanks non-attainment area so that appliance was not reviewed.

7 record(s) returned. Showing records 1-7

New (sorted)	Model (sort)	Manufacturer (sort)	Firebox Volume (Cubic Feet) (sort)	Emission Rate (grams/hr) (sort)	Heat Output (BTUs) (sort)	Overall Efficiency HHV (%) (sort)	Type (sort)	Subtype (sort)	Certified Fuel Type (sort)	Test Method (sort)	CO (g/min) (sort)	NSPS Compliance 2020 (sort)
	210 Ideal Steel Hybrid	Woodstock Soapstone Company, Inc.	3.220	2.1	9465-37583	74	Wood Stove	Hybrid	Cord Wood		0.560	Yes
	206 Fireview Catalytic	Woodstock Soapstone Company, Inc.	1.850	1.1	7606-46460	78	Wood Stove	Catalytic Stove	Cord Wood		0.200	Yes
	202 Palladian, 204 Keystone	Woodstock Soapstone Company, Inc.	1.460	0.85	9989-48437	80	Wood Stove	Catalytic Stove	Cord Wood		0.340	Yes
	209a Progress Hybrid	Woodstock Soapstone Company, Inc.	2.800	0.63	13149-47220	78	Wood Stove	Hybrid	Cord Wood		0.160	Yes
	210a Ideal Steel Hybrid	Woodstock Soapstone Company, Inc.	3.220	0.89	9324-43263	77	Wood Stove	Hybrid	Cord Wood		0.270	Yes
	212N Navajo Hybrid Wood/Coal, 212S Survival Hybrid Wood/Coal	Woodstock Soapstone Company, Inc.		1	15332-27294	79	Wood Stove	Hybrid	Cord Wood		0.150	Yes
	Absolute Steel Hybrid 211	Woodstock Soapstone Company, Inc.		0.5	14426-45317	77	Wood Stove	Hybrid	Crib Wood		0.040	Yes

VIII. *On the pair of summary sheets where NESCAUM/ADEC inadvertently reviewed the same test report twice, there were 25 discrepancies between the two reports, including errors of transcription, opposing claims that data was or was not reported, rounding errors, conflicting or inconsistent "flags" and numeric/arithmetic errors. This is not reassuring in terms of NESCAUM's claimed consistency in generating the summary results, and raises the issue of whether NESCAUM's own consistency and repeatability should be the subject of an audit.*

These two ADEC Summary Reports are reproduced on page 6, and an explanation of most of the errors on page 7. For simplicity sake, I refer to the report that is captioned Model 210a (but really Model 210) as Report A, and the Report that was (correctly) reviewing Model 210 as Report B. Both reports were posted and properly labeled on the Woodstock Soapstone website. But that's not the point; ***these two reviews of the same report should produce similar, if not identical results, but they did not*** [emphasis in original].

These two Summary Sheets, which review the same test report [footnote omitted], *disclose obvious problems in the research and reporting methods employed by NESCAUM/ADEC, and*

the ability/willingness of NESCAUM/ADEC to impose meaningful quality controls on their inquiry. As noted early in this review (see footnote 2), there is little, if any, evidence of NESCAUM/ADEC cross-checking or vetting of the reviews or data in the "Assessment". The task of auditing the "Assessment" and validating its so-called "data" and its various claims will now, probably, fall squarely on EPA.

This is the central irony of this situation; NESCAUM's own data and reporting is guilty of the same failures it attributes to EPA, namely failures in transparency, documentation, and auditing its own work product for consistency, impartiality, and accurateness. The EPA will now become responsible for cleaning up the NESCAUM mess.

NESCAUM response: With regard to auditing the NESCAUM Assessment results, as mentioned in other parts of this response, we have asked EPA to review the NESCAUM/ADEC test review findings. This was a central purpose of doing the Assessment.

Mr. Morrissey comments that NESCAUM reviewed the same test report twice. This is not correct. There are two different test reports that appear to test the same stove twice, as highlighted from the Woodstock Soapstone website (see the screenshot below).[11] In the initial review provided to the manufacturers in September 2020, it was noted that the test report for the Ideal Steel 210a could not be located. In Mr. Morrisey's letter to ADEC dated October 28,2020, a link to the Ideal Steel 210a stove report was provided. In reviewing the second test report, the reviewer noted that the Ideal Steel 210a and 210 models appeared to be the same stove, raising questions about why testing on what appeared to be the same model was done within a relatively short time period (six months). The testing also indicated that one model might meet ADEC's emission standards, while the other did not. The similarity in the appliances and their close proximity in test dates caused significant confusion for the reviewers. In light of this and similar examples with other stove test reports, ADEC sent letters to EPA in November 2020 and February 2021 requesting guidance on how to treat tested models in different test reports that appear to be physically identical. ADEC will determine how to treat these going forward upon receiving a response from EPA.

Ideal Steel Hybrid 210a

Non-Confidential Business- Information Certification Test Report: Woodstock Soapstone/Ideal Steel Model 210a PDF

Model 210a Ideal Steel Hybrid Certification Letter PDF

Ideal Steel Hybrid 210

Non-Confidential Business- Information Certification Test Report: Woodstock Soapstone/Ideal Steel Model 210 PDF

Model 210a Ideal Steel Hybrid Certification Letter PDF

[11] Available at https://www.woodstove.com/index.php/support, accessed on April 4, 2021.

With regard to asserted discrepancies in the test reviews, ADEC contacted all manufacturers on September 1, 2020 as part of its review process to inform them that a review of their certification test reports had been completed and would be publicly posted later in the fall of 2020. During this interim time, ADEC offered a period of review by the manufacturers to identify errors in the summary sheets. Mr. Morrissey requested his review sheets, and sent a letter to ADEC on October 28, 2020. In his letter, Mr. Morrissey laid out issues with postings but did not indicate issues with the listing for the Model 210 Ideal Steel stove, which was tested at Polytest labs in January 2020. To address Mr. Morrissey's concerns identified in his letter at that time, ADEC and NESCAUM undertook another review of the Ideal Steel 210 stove. The most recent review found that all the data contained in the summary sheet for the 210 Ideal Steel stove were correct except for three elements. However, these were not items that were incorrectly flagged as possible deficiencies in the first review. The second review found three new elements that should have been flagged as possible deficiencies under the original review. As stated in the NESCAUM Assessment, additional review of these reports would likely identify more issues than resolve them. NESCAUM notes that ADEC intends to continue eliciting manufacturer feedback on the test reviews and will continue revising its list of acceptable stoves as warranted based on more recent information submitted by manufacturers, including those in Mr. Morrissey's critique here.

The need for continuous revisions underscores a key result of the NESCAUM Assessment, and such revisions do not alter this result. States are put in the position of assessing certification test reports because EPA's review process is incomplete, at best. The NESCAUM Assessment found that information submitted after the original test report often generated more flags than the original review, suggesting that NESCAUM's summary of findings could be underreporting issues. For example, in Mr. Morrissey's critique, he states that there is only one 210 Ideal Stove model. Accepting for purposes of his comment that this is the case, it leaves reviewers with little to no information on why a second compliance test was submitted for what appears to be the same model with a similar but slightly altered model name.

IX. *Unfortunately for NESCAUM/ADEC, it cannot just "interpret" section 8.4.2.2* [footnote omitted] *cited above (captioned "Test Fuel Load Moisture Content") for the proposition that ASTM E3053 requires bark. It cannot ignore the plain language in the Johnson Emails cited at the bottom of page 11, where he "reasonably describes cord wood fuel," while repeatedly citing what comes immediately above (the summary bullet points). NESCAUM/ADEC cannot ignore it's hand-picked authority (the Johnson Emails) when it is convenient. (Johnsone* [sic] *Emails: "It is acceptable to have some bark but not having all the bark stripped off. It is not acceptable to have a test fuel load to consist of bark being stripped off of every piece.") Finally, it cannot do this and claim to be a serious and credible assessment worthy of influencing "policy."*

Elsewhere in Mr. Morrissey's comments, and relevant to NESCAUM's response here, there is a similar comment "*Notwithstanding that the 'Assessment' and the 'BASIS' cite this particular list more than a dozen times in support of their repeated findings that manufacturers violate some opague* [sic] *requirements for barking and wood splitting, both the 'Assessment' and the 'BASIS' inexplicably never cite the next paragraph in the Johnson Emails.* … [quoting the Johnson email, with underline in original] '*It is acceptable to have some bark but not having all the bark*

stripped off. It is not acceptable to have a test fuel load to consist of bark being stripped off of every piece.' [end of email quote]"

NESCAUM response: As previously indicated, the NESCAUM Assessment criterion allows for use of less than 50% debarked wood pieces, and does not require that all pieces contain bark, which is consistent with the quoted EPA email.

NESCAUM agrees with the comment to the extent it recognizes that the NSPS regulation includes opaque requirements. This is consistent with the NESCAUM Assessment finding that in light of these opaque requirements, ASTM 3053 provides too much leeway to assure air quality agencies that the in-use performance of certified wood stoves using the test method will help resolve air pollution problems in local communities.

With regard to ADEC's interpretation NSPS requirements, states have the authority and responsibility to interpret regulations or guidance where regulation or guidance is unclear in order to implement programs consistent with their intent. Where not explicitly prohibited, states also have the authority to adopt more stringent measures than federal requirements. As such, Alaska and other states have inherent authority to interpret unclear EPA regulations or guidance under the Clean Air Act that, at a minimum, achieves the intent of the regulations or guidance. That Mr. Morrissey disagrees with a state's interpretation is not dispositive of bias by Alaska or in the NESCAUM Assessment.

X. *The overall "Assessment" review strategy, and whether it is a credible basis for proceeding to the conclusions that the "Assessment" tries to comes* [sic] *to. This strategy is basically to make a list of each and every requirement imposed by the NSPS, and then see if each and every item on the list can be identified in test reports, no matter how obscure or irrelevant the requirement might be. Otherwise, deficiencies are claimed by NESCAUM/ADEC without any apparent oversight or review, or any basis in fact.*

NESCAUM Response: States do not have the discretion to ignore EPA regulatory requirements under the Clean Air Act. It would also be a subjective undertaking to determine what parts of regulatory requirements should be deemed "obscure or irrelevant."

As noted previously, EPA as part of its review process has developed its own deficiencies list (https://www.epa.gov/sites/production/files/2021-04/documents/epa_wood_heat_test_report_corrective_action_list_v1_rev1_apr_15_2021.pdf). Of the 40 items contained in the ADEC/NESCAUM review criteria, EPA listed 37 of them and added an additional 12 items not contained in the ADEC/NESCAUM review. Rather than overreaching, EPA's list indicates that the ADEC/NESCAUM review did not review all regulatory elements. Of the three elements that EPA did not include in its deficiencies list (debarking, negative filter weight, and fuel placement), EPA did not contradict the NESCAUM Assessment's use of these, rather it remained silent. In this light, EPA's list does not support Mr. Morrissey's comments on the review elements used in the NESCAUM Assessment.

AGH Blog

ADEC's and NESCAUM's review was hastily done without sufficient fact-checking.

- The review process took four staff more than six months to complete.
- ADEC informed manufacturers of summary sheets and offered review prior to posting. copies of the summary findings on September 1, 2020. That notice told manufacturers that if they found incorrect information in the summary sheets, they should notify ADEC and it would address identified issues. The NESCAUM Assessment used data from February 2021, giving manufacturers five months to identify issues before NESCAUM completed the summary analysis.

The report carries an unfounded degree of authority that is now reverberating throughout the wood stove industry and its state and federal regulators, and the wider public is less likely to see these rejoinders.

- On February 3, 2020, more than a month before the release of the NESCAUM report, EPA sent a letter to testing labs and third-party certifiers stating EPA was conducting its own review of the test reports. In that letter, it stated, "To date we have seen sufficient information to anticipate a number of major findings." This indicates that EPA has reviewed the results of test reports also, and that these warranted EPA initiating its own review.
- With regard to rejoinders, NESCAUM is including Mr. Morrissey's comments in their entirety here as part of NESCAUM's responses so that readers will have access to his full comments when reviewing these responses.

Numerous individuals have approached northeastern state government agencies who are members of NESCAUM, urging them to distance themselves from the report and not let their agency names be used on such reports in the future without more due diligence.

- NESCAUM's Board of Directors are the air agency directors of its member states. The Board received routine briefings for several months before the release of the report on the preliminary and deliberative findings of this effort. The final report was provided to the Board several weeks in advance of publication, and NESCAUM addressed all Board comments. As of June 15, NESCAUM has not received requests to redact an agency's name from the report.
- NESCAUM notes that after the release of the NESCAUM Assessment, a letter signed by six state air agency leads, including three NESCAUM Board members, was sent to EPA on April 28, 2021 that references the NESCAUM report and requests that EPA revoke the use of two broadly applicable test methods based on ASTM 3053 for certifying Step 2 wood burning devices.
- NESCAUM also notes that on May 21, 2021, the state attorneys general of nine states and the Puget Sound Clean Air Agency sent a similar request to EPA. Five of the states overlap with NESCAUM's member agencies (Massachusetts, New Jersey, New York, Rhode Island, and Vermont).

ATTACHMENT

REVIEW (PART 1)

of

ASSESSMENT OF EPA's RESIDENTIAL WOOD HEATER CERTIFICATION PROGRAM

Test Report Review: Stoves & Central Heaters

Written by NESCAUM, March 2021

Reviewed by:
Thomas Morrissey
Woodstock Soapstone Company, Inc.
66 Airpark Road
West Lebanon, NH 03784
May 15, 2021

REVIEW (PART 1)

of

"ASSESSMENT OF EPA's RESIDENTIAL WOOD HEATER CERTIFICATION PROGRAM"

Written by NESCAUM, March 2021

In March 2021, the Northeast States for Coordinated Air Use Management (NESCAUM) published a document entitled "Assessment of EPA's Residential Wood Heater Program" ("Assessment"). The "Assessment" is the result of a review conducted by NESCAUM "in collaboration with the Alaska Department of Environmental Conservation" (ADEC).

The "Assessment" is intended to influence "policymakers" by claiming 1) that the EPA Certification Program is dysfunctional and a systemic failure,[1] 2) that there are a significant number of discrepancies and omissions in test reports submitted to EPA for approval,[2] 3) that EPA has failed to conduct compliance audits,[3] and 4) that the NESCAUM and ADEC could do a better job than EPA in, a) determining which stoves are in fact the cleanest burning and, b) developing a test method for certifying wood burning appliances. NESCAUM has provided scant data to back up these major claims, and some of the data that it does present is riddled with discrepancies, omissions, bias errors, and conflict of interest, as detailed below. Bias is evident everywhere; in tone and use of language, in lack of transparency, in the selection of subjective criteria to attempt to discredit test methods and results, and in its attempt to advance NESCAUM's own agenda[4] with its "policy recommendations." The bias is so pervasive that it undermines much of the "Assessment."

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[1] Sweeping claims of dysfunction, systemic failure, and cheating appear IMMEDIATELY in the "Assessment," first appearing on page iii, in The Summary for Policy Makers. A reader of the "Assessment" needs to be mindful that the document is essentially political in nature (i.e., it aims explicitly to influence policy-makers) and not a scientific inquiry, or a dispassionate review. The "Assessment" is a political diatribe that attempts to advance a specific agenda. The "Assessment" describes methods used to collect evidence that are subjective and not evidence based, and it arrives at conclusions that are often biased, subject to conflicts of interest, and unsupported by the facts.

[2] The "Assessment" is a "screening level analysis" ("Assessment" pg xiii; pg. 16). Data was apparently collected by individual reviewers, each filling out an Excel spreadsheet while reviewing individual test reports online. The decision to use data accumulated by individual reviewers (without cross-checking, verification or other quality control) was apparently based on just one event where three people reviewed the same report and came to similar conclusions:

> "To assess the review tool (i.e., spreadsheet) performance, three people reviewed the same report independently. A comparison of the three reviews found that all three reviewers identified the same flags. All three reports obtained the same preliminary review determination. Based on this effort's findings, the team agreed that the tool (i.e., spreadsheet) was sufficient to allow multiple people to complete test report reviews." ("Assessment," page 16)

Quite remarkably, given the focus of the "Assessment", there appears to have been little quality control after this initial comparison of one report, by three people. The "Assessment", cites statistics from this "screening level analysis" as though they represent a thorough, objective, factual assessment of these reports, but there is scant evidence of thoroughness, objectivity, or quality control in collecting data for the "Assessment."

[3] EPA does routinely conduct unannounced audits of manufacturers' facilities and inspections of certified products. The claim that they do not conduct audits of test results by randomly selecting stoves and re-testing them at a different test facilities may be correct.

[4] The "Assessment" contains a disclaimer which states "NYSERDA, the States of Alaska and New York, and NESCAUM make no warranties or representations, express or implied, as to the fitness for a particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report." ("Assessment," Page iv, emphasis added). The authors of the "Assessment" make both express and implied representations about the "usefulness, completeness and accuracy" about EPA's test review processes, their own review process, and multiple test methods. They cannot disclaim what they explicitly set out to do. Failure to review their own claims and representations – in this case their disclaimer – is a recurring feature of the "Assessment", from beginning to end.

In addition to the "Assessment" of on-line woodstove test results, NESCAUM has developed its own entirely new woodstove test protocol called Integrated Duty-Cycle Test Method (IDCTM), along with a new method of measuring woodstove emissions using a Tapered Element Oscillating Measurement device (TEOM).[5] Changing two major variables in certification test procedure (the actual test procedure from the current method(s) to the IDCTM and the method of collecting particulates from the dilution tunnel method to TEOM) is a violation of the principle of "vary-one-thing-at-a-time" (VOTAT). The result of changing two major variables at the same time might well produce a tangle of results requiring significant time and effort to tease apart.

The New York State Energy Research and Development Authority (NYSERDA) funded NESCAUM's development of the IDCTM, and NYSERDA owns[6] this new, unused method. ADEC adopted the IDCTM test method as the only approved cordwood test method in Alaska, notwithstanding that it has never been used for certification testing of a single stove. Alice Edwards of ADEC applied to EPA for approval of this method as a broadly applicable alternative test method, for use in testing new wood stoves, and her request was approved on 4/9/21. In approving Ms. Edwards request for approval of this new test method, EPA stated the following:

> "You state that ADEC has recently reviewed wood heater certification test reports that used Alternate Test Method 125/127 which leverage ASTM E-3053 and that this review has raised serious concerns about certain aspects of the test method. Given your concerns regarding ASTM 3053 and the importance of having and advancing cordwood test methods for certifying wood heaters under the NSPS, you have requested an additional cordwood certification test method option" (Letter from Steffan M. Johnson, US EPA to Alice Edwards, ADEC, dated 4/11/21)

The only other approved cordwood test method is ASTM E-3053, referenced in the comment above, which was approved by EPA on February 28, 2018 (over 3 years ago). The ASTM E-3053 method has been used to test 85 of approximately 148 wood stoves currently on the EPA certified list, or 57% of all approved stoves. The 85 stoves approved using the ASTM E-3053 method have generated at least 255 fully documented data sets for individual test runs. The IDCTM method, developed by NESCAUM, owned by NYCERDA and adopted by ADEC has yet to be used even one time.

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[5] In the interest of full disclosure, NESCAUM donated a TEOM to Woodstock Soapstone Company for R&D work a number of years ago, and it was brilliant and indispensible for getting "real-time" results and expediting R&D efforts. However, whether this device is capable of providing the consistent emissions measurements required for certification testing and valid comparison between appliances is an open question.

[6] Each page of the IDCTM has a watermark that says "DO NOT COPY" and each page contains the following header:
THIS INTEGRATED-DUTY-CYCLE (IDC) PROTOCOL FOR WOOD STOVES IS THE PROPERTY OF THE NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA) AND CAN BE USED TO TEST TECHNOLOGIES IN A LABORATORY SETTING. ANY DEVIATIONS OR CHANGES TO THIS IDC PROTOCOL FOR WOOD STOVES ARE NOT APPROVED OR SANCTIONED BY NYSERDA.
DO NOT CITE, COPY, or DISTRIBUTE THIS IDC PROTOCOL FOR WOOD STOVES WITHOUT THE WRITTEN PERMISSION OF NYSERDA

Error, Bias, and Conflict of Interest in NESCAUM's Attack on ASTM E-3053

On its website, ADEC specifically says that it has not approved any stove tested with the ASTM E-3053 Method, and further states that it anticipates removing stoves approved by EPA using the ASTM E-3053 it from its own, state-approved woodstove list. The "Assessment" states:

> **5.2.4 Improving Certification Test Methods**
> Current cordwood test methods used to certify residential wood heaters are poorly designed and often lack the specificity to ensure viable and comparable emission results. **EPA should revoke or modify problematic test methods. The ASTM 3053 test should be revoked as a Broadly Applicable Test Method...**
> ("Assessment," page 70, emphasis added)

The "Assessment" is critical of the ASTM E-3053 method. However, most of the criticisms are based on subjective, and often completely false, characterizations of this method.

Much of the NESCAUM/ADEC criticism of this method is related to fueling protocols[7] used for testing. Specifically, NESCAUM/ADEC allege widespread "doctoring" of cordwood fuel by "debarking" the fuel, and "squaring" cordwood pieces before testing. Additional criticism is directed toward how the firebox volume is calculated, whether such calculations are consistent with owners' manuals, whether the length of the cordwood fuel for testing was correctly calculated, and whether the fuel was loaded in the correct direction.

An additional criticism was whether or not the medium burn rate in the test results corresponded to a rate *preferred by* the ADEC reviewers, but not required by the test.

In order to assess NESCAUM/ADEC's data analysis and conclusions, we need to first look carefully at its data collection methods and ask whether the underlying data is complete, credible, and unbiased. The main focus of this Part One of A Review of the "Assessment" is on how data was collected and tallied on "Summary Review Sheets" by ADEC.

On the following pages I raise concerns about quality control, bias, and conflict of interest in NESCAUM/ADEC's acquisition of data. It is clear that NESCAUM/ADEC reviewers lacked objectivity in assessing information, particularly with regards to the ASTM E-3053 method, and they reviewed individual test reports (knowingly or not) with the intent to discredit the ASTM E-3053 and advance their own interest in promoting the IDCTM method.

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[7]Oddly enough, the fueling protocols in the IDCTM are very similar to those in the ASTM E-3053, and the method for calculating the parameters for a fuel load are almost identical. In spite of its criticisms of ASTM E-3053, the IDCTM is remarkably similar.

The Attempt at Regime Change

NESCAUM also recommends in its "Assessment" a federal policy which would require that any stove qualifying for the 26% Federal Tax Credit should have NESCAUM/ADEC approval as a qualification for the tax credit. The "Assessment" states:

> **5.2.3 Targeting Public Funding to Cleanest Appliances**
> "Taxpayer-supported incentive programs, such as the 26 percent federal tax credit created under the BTU Act, EPA Targeted Airshed grants, and state supported activities should only apply to those appliances included on the list of approved models developed by the Alaska Department of Environmental Conservation. This is currently the only thorough review of certification test reports applying the 2015 RWH NSPS requirements. ("Assessment," page 70)

In effect, the triumvirate of NESCAUM/ADEC/NYSERDA want to create a "super EPA" to supplant the existing federal EPA for the testing and certifying woodstoves.

The "Assessment" proposes that if New Hampshire residents, or residents of any of the other lower 48 states, wish to purchase low-emitting, high efficiency stoves from my New Hampshire factory, these stoves would have to be approved by EPA ***and*** ADEC. Woodstock Soapstone Company would have to comply with the Alaska regulatory scheme (which currently only recognizes the NYSERDA ICDTM test method and the unproven TEOM measuring devices). The "Assessment" proposes that buyers should be punished (by being excluded from the federal 26% tax rebate) unless they buy stoves tested with the new IDCTM method. Currently there are no such tested stoves.

The triumvirate (NESCAUM/ADEC/NYSERDA) would use the Alaska regulatory scheme to coerce manufacturers to use their test method, because they propose to revoke the current cordwood method, and replace it with their own method. In this way, the "Assessment" is breathtakingly arrogant, hubristic, and self-serving. The conceit of the "Assessment" is risible.

The "Assessment" Contains Serious, Nontrivial Errors That Ruin Trust In Its Research Practices and Conclusions

All ADEC data sheets that I have reviewed are undated and unsigned. Most have few, if any comments. Many have unfilled spreadsheet boxes (data not collected). All of the ADEC reports of stoves made by Woodstock Soapstone Company have serious omissions, errors of fact, misreporting, and untrue statements. Of six Woodstock Soapstone Company models approved to the EPA 2020 Standards, two models were missing entirely, and one model was reviewed twice, on separate data sheets that were inconsistent and did not match (i.e., different reviewers looking at the same data, or the same reviewer on different dates looking at the same data). The fact that ADEC reviewed the same data twice, and the two completed spreadsheets are markedly different, speaks to the concern (also noted in footnote #2) about quality control.

On the pair of summary sheets where NESCAUM/ADEC inadvertently reviewed the same test report twice, there were 25 discrepancies between the two reports, including errors of transcription, opposing claims that data was or was not reported, rounding errors, conflicting or inconsistent "flags" and numeric/arithmetic errors. This is not reassuring in terms of NESCAUM's claimed consistency in generating the summary results, and raises the issue of whether NESCAUM's own consistency and repeatability should be the subject of an audit.

These two ADEC Summary Reports are reproduced on page 6, and an explanation of most of the errors on page 7. For simplicity sake, I refer to the report that is captioned Model 210a (but really Model 210) as Report A, and the Report that was (correctly) reviewing Model 210 as Report B. Both reports were posted and properly labeled on the Woodstock Soapstone website. But that's not the point; ***these two reviews of the same report should produce similar, if not identical results, but they did not.***

These two Summary Sheets, which review the same test report,[8] disclose obvious problems in the research and reporting methods employed by NESCAUM/ADEC, and the ability/willingness of NESCAUM/ADEC to impose meaningful quality controls on their inquiry. As noted early in this review (see footnote 2), there is little, if any, evidence of NESCAUM/ADEC cross-checking or vetting of the reviews or data in the "Assessment". The task of auditing the "Assessment" and validating its so-called "data" and its various claims will now, probably, fall squarely on EPA.

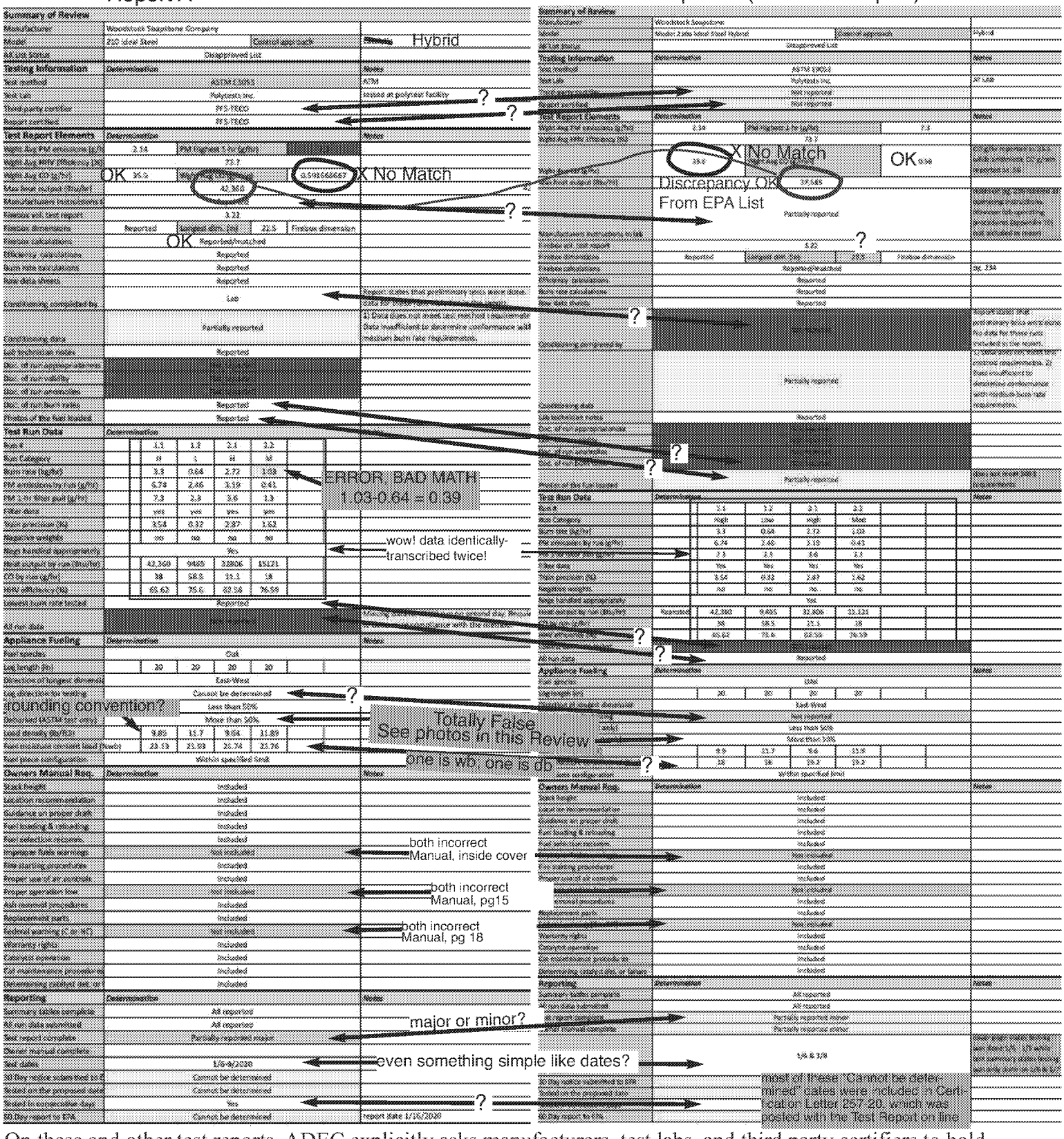
This is the central irony of this situation; NESCAUM's own data and reporting is guilty of the same failures it attributes to EPA, namely failures in transparency, documentation, and auditing its own work product for consistency, impartiality, and accurateness. The EPA will now become responsible for cleaning up the NESCAUM mess.

8 Precise replication of the "Test Run Data" from one summary sheet to the other, as well as the precise replication of other data (firebox size, load density, etc.) indicates conclusively that these two summary sheets were completed using the same test report.

Here are two "Summary Data Sheets filled out by NESCAUM/ADEC which review the same test report (that's why the "Test Run Data" is transcribed exactly from one summary to the other, for example). But there is no consistency from one report to the other. The pattern of mistakes and errors is common throughout ADEC's Summary Sheets

Report A

Report B (same test report)



On these and other test reports, ADEC explicitly asks manufacturers, test labs, and third party certifiers to hold ADEC's hand while it goes through these Summary Reports and corrects it's errors, under the threat of being excluded from selling wood stoves in Alaska.

Discrepancies between Report A and Report B, which look at the same test report

1. Report B indicates incorrectly that Third Party Certifier and Report Certified were unreported. Report A correctly identifies both as PFS-TECO;

2. Report A correctly reports CO in g/hr, but not in g/min; Report B incorrectly reports CO in g/hr and and incorrectly in g/min) Report B reports g/min to 9 decimal places but neither test report calculates to that degree of specificity;

3. Report A correctly states that "Manufacturer's instructions to lab" are reported; Report B indicates incorrectly that they are partially reported;

4. Both reports indicate that the longest firebox dimension is 22.5", however only on Report B is an ORANGE FLAG assigned to this dimension;

5. Report B incorrectly says "Conditioning completed by" was not reported (RED FLAG), while report A states correctly that "Conditioning completed by" ("Lab") with NO FLAG;

6. Report B says that "Doc. Of burn rates" was Not Reported (RED FLAG), but Report A looks at the same information and CORRECTLY indicated "Reported" (NO FLAG);

7. Report B indicates "Photos of fuel loaded was "Partially Reported"(ORANGE FLAG), while Report A indicates "Reported" (NO FLAG)

8. Both reports transcribe exactly the same numeric test data under "Test Run Data", but Report A assigns an ORANGE FLAG to the Medium Burn Rate of 1.03 kg/hr, presumably because the difference between the low burn rate (0.64 kg/hr) and the medium burn rate (1.03 kg/hr) violates the completely arbitrary determination by ADEC that there should be a difference of at least 0.30 kg/hr. between low and medium burn rates. So there is a double error here: a) failure to correctly calculate the burn rate differential (which is 0.39 kg/hr) and b) the assignment of an orange flag. Report B has no orange flag, presumably because the reviewer did better arithmetic.

9. There is another problem with the 0.30 kg/hr differential, which is that this review criteria is arbitrary. This is discussed later.

10. Report B incorrectly states that "Lowest burn rate tested" was not reported (RED FLAG); Report A indicates that "Lowest Burn rate tested was "Reported"

11. Report B states that "All run data" was "Reported," while Report A states (incorrectly) that "All run data" was "Not Reported" (RED FLAG).

12. Report B says that "Log direction for testing" was "Not reported" (ORANGE FLAG), while Report A says that the log direction "Cannot be determined" and has NO FLAG. Notwithstanding these two comments, both reports indicate that the fuel was 20" and the maximum firebox dimension is 22.5." Based on that information and the photos provided, there is only one direction that the logs can be loaded into the stove. Photos are also included in the test report which clearly indicate the direction in which the wood is inserted into the stove.

13. Both reports state that "Wood was squared" "Less than 50%". This is completely false. The wood used for testing was split cordwood. Wood was not squared at all; it wasn't <50%; it was 0%.

14. Both reports state that Wood was debarked "More than 50%". The statement that wood was "debarked" more than 50% is completely baseless and false, and contradicted by photographs of the test fuel.

15. The "Load density" reporting has similar numbers, but rounded to different values (i.e., Report B has values of 9.9, 9.6, 11.9; Report A has the same results indicated as 9.85, 9.64, 11.89). Given the nitpicky posture of the "Assessment" this failure to adopt a rounding protocol is an error.

16. In Fuel Moisture Content load (%wb), Report A correctly reports Wet Basis, and Report B incorrectly reports Dry basis for all four loads;

17. Under "Test report complete," Report B indicates "Partially reported minor " (YELLOW FLAG), but Report A indicates "Partially reported major" (ORANGE FLAG).

18. Report B indicates that "Owner manual complete" is "Partially reported minor" (YELLOW FLAG), while Report B States that Owner manual complete is "blank" (NO FLAG). What is interesting about this discrepancy is that the "Assessment" claims the following about its so-called spreadsheet "tool":

> "Both the review tool and summary reports automatically generated warning flags, *which provide an objective identification of significant problems with the reporting or testing*" (emphasis added, Assessment page 19)
>
> In this case reviews of the "Owners Manual Requirements" was the same for both reports, but the spreadsheet "tool" generated a YELLOW FLAG for Report B and nothing at all (NO FLAG) for Report A. This is, obviously, an error either in reporting or spreadsheet design.

19. Under "Test dates" Report B says "1/6 and 1/8, While Report A says 1/6-1/9/2020.

20. As to whether the unit was "Tested in consecutive days, Report B says "No" and Report A says "Yes."

21. A to whether the report was submitted to EPA within 60 days, both Report A and B say "Cannot be determined" (YELLOW FLAG). However, the report application to EPA is attached, signed, and dated 2/17/20 – obviously within 60 days,

The ADEC Summary Sheets:
Lots and Lots and Lots of Errors

For the purpose of this initial review, I will focus mainly on stoves made by Woodstock Soapstone Company. Next, I will examine the ADEC Summary Sheet for our Model 202/204. This is a "plain vanilla" Summary Sheet, compared to Model 210, on pages 6 and 7, above.

ADEC encourages manufacturers to "review their certification test report summaries and submit corrections, and that any substantiated errors or corrections will be applied to the summary sheet." So, I'll just make the corrections here. On our Model 202/204, the ***initial*** ADEC summary sheet (see next page, LEFT COLUMN) makes the following errors (WHICH CUMULATIVELY TOTAL 13 FLAGS). I intend to address THREE ADDITIONAL RED FLAGS (related to Documentation of 1) run appropriateness, 2) run Validity, and 3) run anomolies on Part 2 of this Review.

What is facinating is that between early April 2021, when I downloaded the original Summary Review Sheet, and today (mid-May, 2021), ADEC performed an additional review and corrected some of its original errors, and made some new errors. Here are comments on the initial ADEC SUmmary Sheet. Comments on the revised Summary Sheet are on the next page.

1: The Model 202/204 summary sheet assigns 3 YELLOW FLAGS (each labeled "Cannot be determined") for a) whether a 30 day notice of testing was submitted, b) whether the stove was Tested on the Proposed Dates, and c) whether the test report was submitted to EPA within 60 days.

Certification Letter #267-20 was posted on our website along with the test report itself. This letter states:

"Based on the April 8, 2020 test report prepared by Services Polytest Inc. demonstrating compliance with the February 28, 2018, EPA-approved Cord Wood Alternative Test Method 125 (ATM-125) and the information provided in your April 17, 2020 application, the above referenced models are certified as meeting the 2015 NSPS. Under the 2015 NSPS and based on PFS TECO's April 23,2020, certification of conformity, the models' emission rate of 0.85 g/hr meets the 2020 NSPS cordwood particulate matter emissions limit of 2.5 g/hr. The heat output range and overall heating efficiency for the above referenced models are 9,989 – 46,437 BTU/hr and 80%, respectively. The carbon monoxide emission rate for this model is 0.34 g/min. (EPA Certification Letter Number 267-20)

Note that the relevant dates sought by NESCAUM/ADEC are italicized above, and note also that this letter referenced CO emissions data that ADEC claimed was missing (see #2 below).

2: The ADEC review for Model 202/204 gives 2 ORANGE FLAGS for not reporting CO emissions, either in CO weighted average g/h or CO average g/min. However, both of these CO calculations are reported on page 9 of the Test Report on Woodstock Soapstone Company's website, along with CO emissions for each individual run.

3: The ADEC review for Model 202/204 gives a 1 RED FLAG claiming that "Manufacturer's Instructions" are "Not Reported". The instructions are clearly printed on page 194 of the test report, which is published on line at our website.

4 : The ADEC review for Model 202/204 assigns 2 RED FLAGS for Squaring and Debarking wood, which is completely and totally false. Photographs of the test fuel appear on page 23.

5. The ADEC summary sheet gives a 1 YELLOW FLAG for "Log Direction for Testing." Notwithstanding that there are photos of the fuel burning in the firebox, the line above the YELLOW FLAG says the longest firebox dimension is East-West. The firebox is 18.75" long x 10.75" deep, and the fuel is 16" long. As a practical matter, there is only one way it will fit.

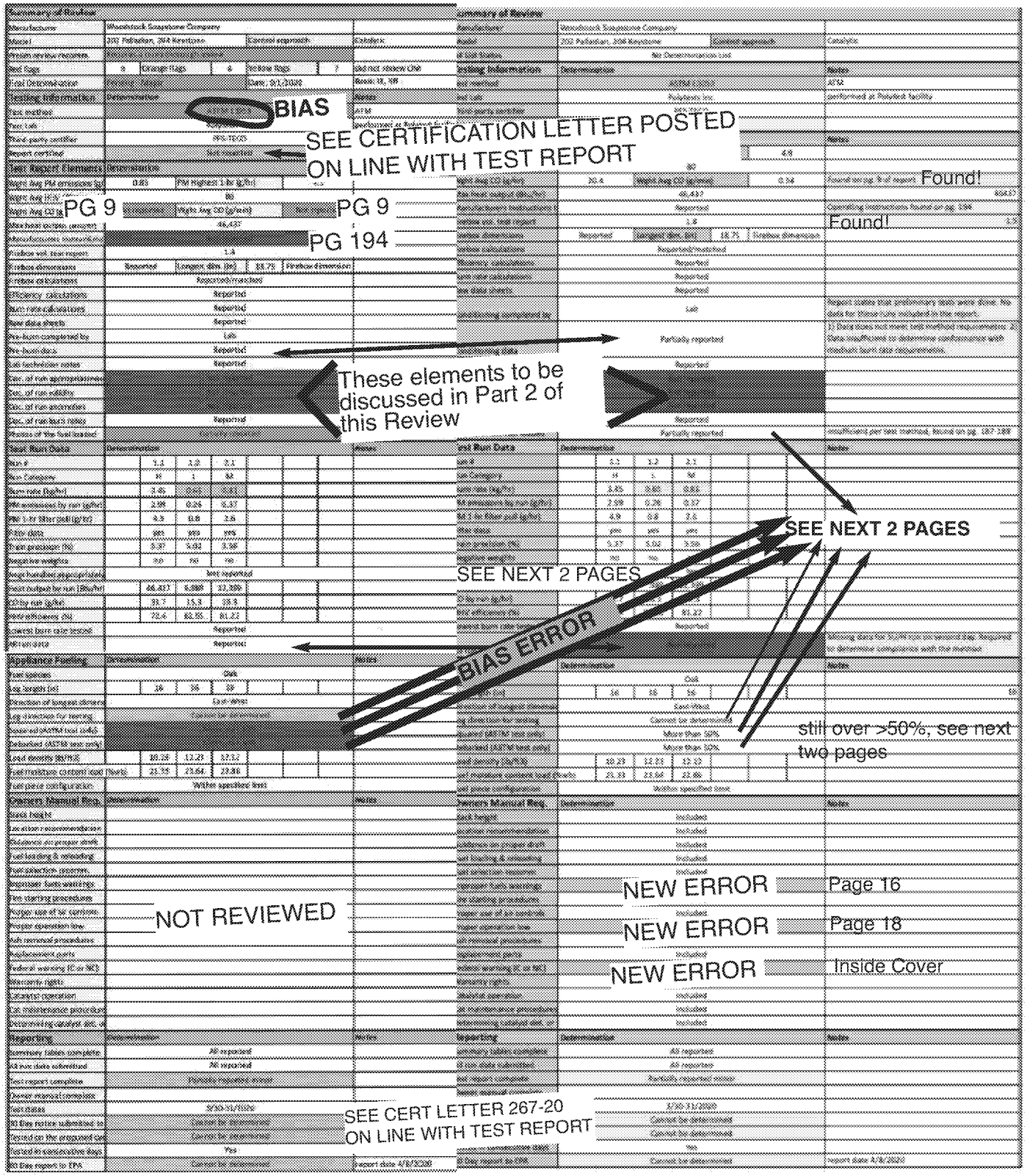
6. However, according to the ADEC review "method" the three flags in 4. and 5. above give rise to an 1 ORANGE FLAG for the ASTM Method E3053, as explained below (basically if a unit gets 3 flags related to Appliance Fueling, and it uses Method E3053, it is disqualified).

7. In this case this model also gets an additional 2 ORANGE FLAGS, one for "Needs a More Thorough Review" and one for "Pending-Major" on a final determination.

8. Just for fun, this Model gets a 1 YELLOW FLAG for "Report Certified" even though the certification letter indicates it was certified by PFS-ATECO on April 23, 2020.

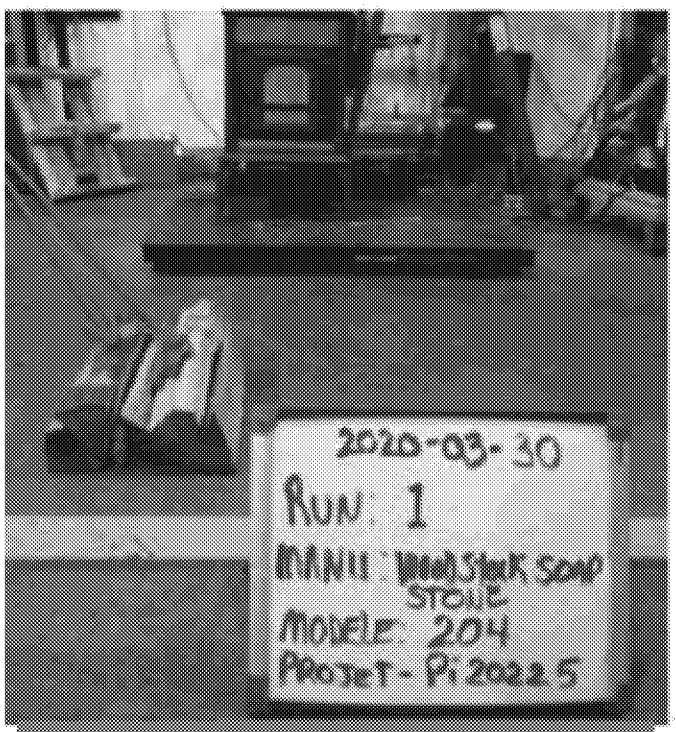
Initial review (downloaded 4/2021

Subsequent review (downloaded 5/2021



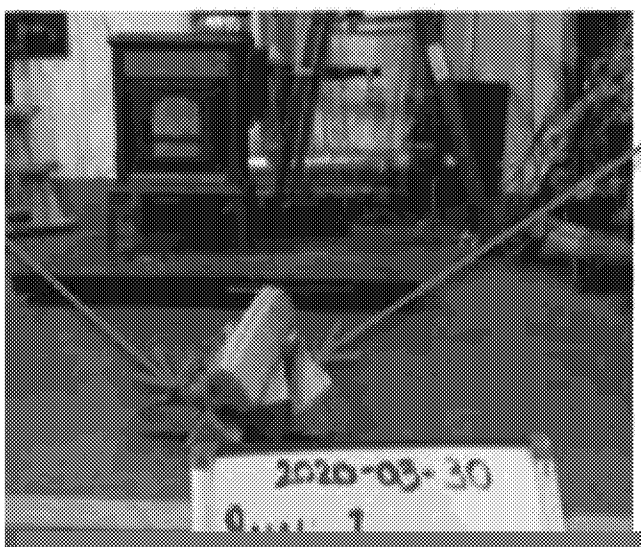
According to the ADEC "PROCESS", I am supposed to address all of these "issues" by discussing them with ADEC, and maybe submitting modified or reformed test reports. Then ADEC will makes changes as it deems appropriate. Or not.

Below are photographs of the test fuel loads used for Model 202/204 that NESCAUM/ADEC reported were "debarked" over 50%, and "squared "over 50%".

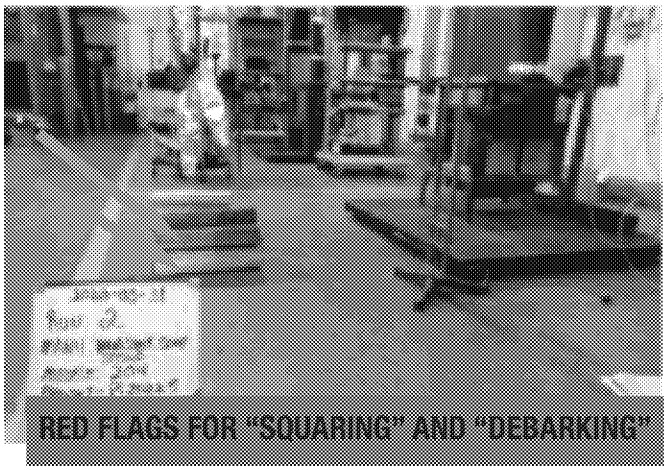


RED FLAGS FOR "SQUARING" AND "DEBARKING"

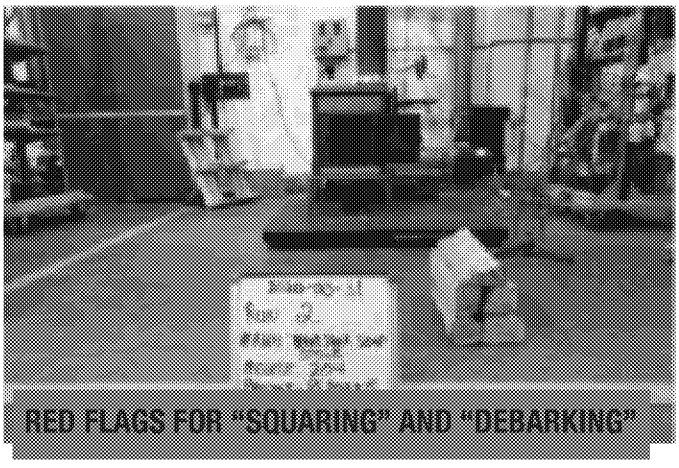
RED FLAGS FOR "SQUARING" AND "DEBARKING"



RED FLAGS FOR "SQUARING" AND "DEBARKING"



RED FLAGS FOR "SQUARING" AND "DEBARKING"



RED FLAGS FOR "SQUARING" AND "DEBARKING"

Both the "Assessment" and the "ADEC REGULATORY BASIS FOR CRITERIA AND FINDINGS" ("BASIS") contain email correspondence from Steffan Johnson of EPA MTG (Johnson Emails) as appendices to their reports. Both documents cite the comments from the Johnson Emails with respect to Mr. Johnson's opinion that manufacturers may not give instructions for the certification tests that "stray from typical homeowner operation." He further states that:

> "examples of such instructions (*from manufacturers to test labs*) with respect to a cord wood compliance test include (but are not limited to):
> •Removing bark prior to use as a test fuel.
> •Shaping or extreme sorting to constitute preference for a particular shape of fuel load (not to emulate crib fuel (sic) or create triangular crib fuel).
> •Loading and lighting fuel inconsistent with instructions in the appliance owners manual.
> •Complicated fuel placement instructions that would not ever be followed by a homeowner.
> •Manipulation of the ash bed inconsistent with, or otherwise in addition to, instructions included in the owner's manual, or in a manner that a homeowner is unlikely to ever follow. Failure to meet the method required fuel loading specifications (shortened fuel, partial loading, or not using the full firebox area to calculate fuel loading).
> •Limiting fuel loading during complaince testing that will easily be overridden by a home owner seeking a longer burn time.
> •Instructions that specifically override specified sections of the test method OR the subpart rule language (inside or outside the test method requirements."

Notwithstanding that the "Assessment" and the "BASIS" cite this particular list more than a dozen times in support of their repeated findings that manufacturers violate some opague requirements for barking and wood splitting, ***both the "Assessment" and the "BASIS" inexplicably never cite the next paragraph in the Johnson Emails. It reads as follows:***

> "For reference, we have put together what we feel reasonably describes cord wood fuel:
> A cross sectional end view should not form a perfect (or near perfect) square (except occasionally) but to be of a triangular or trapezoid shape with ill regular lines, some curvy, some zig zag. But not all having the same length (pie shape is fine). *It is acceptable to have some bark but not having all the bark stripped off. It is not acceptable to have a test fuel load to consist of bark being stripped off of every piece*. We expect to have wood pieces that are torsion shaped or pieces that are rounds, semi-rounds, have rounded edges, or are larger at one end and smaller at the opposite end. No fuel load should consist of pieces all chosen to be the same size/shape characteristics." (Emphasis Added)

I submit that the pictures above show cord wood loads that meet the explicit terms defined in the Johnson Emails, as well as the (similar) characteristics defined in ASTM E-3053. I also submit that the findings of NESCAUM/ADEC that these loads have been "debarked" and "squared" is evidence of bias and misconduct in their data collection method.

The ADEC Summary sheets show all but one stove tested with ASTM E-3053 received "warning flags" for "Squared" or "Debarked" cordwood fuel. The "BASIS," dated March 2, 2021 describes "squared" or "debarked" wood as follows:

> **Squared:** "If the unit was tested with wood that the reviewer determined had more than 50% of the pieces shaped or squared, this resulted in the generation of a red flag... If the photos from testing reflected typical cordwood, the tool did not generate a flag.
>
> "The definition of cordwood contained in ASTM 3053 does not define squared wood as cordwood. Therefore ADEC has determined that if the fuel charge is composed of pieces using squared wood, the pieces do not meet the definition of cordwood contained in the test method." (BASIS, pg 32)

> **Debarked:** "This element identifies the amount of bark on the fuel pieces used in the certification test. If the unit was tested with wood that the reviewer determined had more than 50% of the pieces without bark, the review tool generated a red flag. If this information could not be determined from reviewing the data report and/or photos were deemed insufficient, a determination of "cannot be determined" with a yellow flag was generated."
>
> "Evidence of purposeful debarking was defined as more than 50% of the pieces appearing to have bark removed, and a flag was generated... **The group interpreted the method to require bark based on the requirements in section 8.4.2.2, where the method provides direction for fuel moisture measurement when adhered thick bark conditions are encountered.**" (BASIS, pg 33, **emphasis added**)

Unfortunately for NESCAUM/ADEC, it cannot *just "interpret" section 8.4.2.2*[9] *cited above (captioned "Test Fuel Load Moisture Content") for the proposition that ASTM E3053 requires bark.* It cannot ignore the plain language in the Johnson Emails cited at the bottom of page 11, where he "reasonably describes cord wood fuel," while repeatedly citing what comes *immediately above* (the summary bullet points). NESCAUM/ADEC cannot ignore it's hand-picked authority (the Johnson Emails) when it is convenient. (Johnsone Emails: "It is acceptable to have some bark but not having all the bark stripped off. It is not acceptable to have a test fuel load to consist of bark being stripped off of every piece.") Finally, it cannot do this and claim to be a serious and credible assessment worthy of influencing "policy."

But the fact is that *ADEC has adopted this posture*, and then has *disqualified nearly every stove that tested with ASTM E3053 on the basis that each stove runs afoul of ADEC's "Squaring" and "Debarking" criteria.* All one has to do in most cases is look at photographs of the test fuel, read the definition of cord wood test fuel in the Johnson Emails, and then apply the "reasonableness" principle (also described in the Johnson emails) to realize that severe bias has driven the "Assessment" right off the rails.

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[9] "For fuel pieces with tightly adhered tight bark (defined as more than 1/8 in (3.2mm) thick), the thickness of the bark shall be added to the electrode penetration depth or the bark shall be removed in the area where the moisture readings are taken." ASTM E3053, page 7

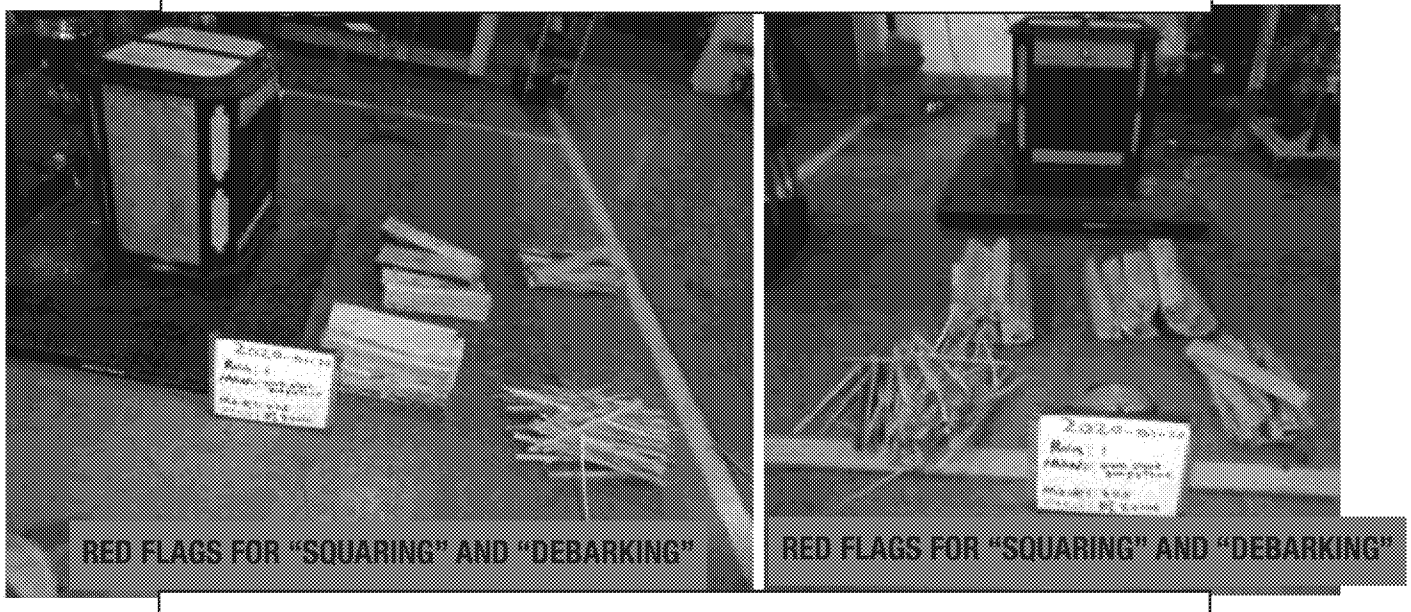
Below is a chart showing ADEC's summaries for "Squaring" and "Debarking" of 69 stoves it reviewed that used ASTM E3053. The red cells = red flags; the yellow cells = yellow flags, the orange cells = orange flags, and the green cells = conforming to the method. Two of the green cells contain the word "No" which is not in the drop down menu provided to reviewers using this spreadsheet, and may be errors or anomalies.

SAID #	Manufacturer	Model	Test Method	Squared	Debarked	Lab	Test LDC
1	FPI / Regency Fireplace Products	F2450	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
2	FPI / Regency Fireplace Products	I2450M, HI2450M	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
3	FPI / Regency Fireplace Products	CI2700, HI500	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
4	FPI / Regency Fireplace Products	F2500	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
5	FPI / Regency Fireplace Products	F3500	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
6	FPI / Regency Fireplace Products	F5200	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
7	FPI / Regency Fireplace Products	I2500	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
8	FPI / Fireplace Products International	F1150, I1150	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
9	Kuma Stove and Iron Works	LE, Aberdeen LE, Alpine LE	ASTM E3053	<50%	<50%	OMNI	Myren
10	Kuma Stove and Iron Works	Classic LE, Cambridge LE, Cascade	ASTM E3053	<50%	<50%	OMNI	Myren
11	Innovative Hearth & Home		ASTM E3053	<50%	<50%	Polytests	Poly Lab
12	Innovative Hearth		ASTM E3053	<50%	<50%	PFS-TECO	PFS Auburn
13	Innovative Hearth		ASTM E3053	<50%	<50%	PFS-TECO	MFG Fac
14	Travis Industries		ASTM E3053	<50%	<50%	Polytests	Poly Lab
15	Travis Industries		ASTM E3053	<50%	<50%	OMNI	Travis Fac
16	Travis Industries		ASTM E3053	<50%	No	OMNI	Travis Fac
17	Travis Industries		ASTM E3053	<50%	<50%	OMNI	Travis Fac
18	Travis Industries		ASTM E3053	<50%	<50%	OMNI	Travis Fac
19	Travis Industries		ASTM E3053	<50%	<50%	OMNI	
20	Travis Industries	44 Elite	ASTM E3053	<50%	<50%	OMNI	Travis Fac
21	Travis Industries	36 Elite	ASTM E3053	<50%	<50%	OMNI	Travis Fac
22	Travis Industries	Insert	ASTM E3053	<50%	<50%	OMNI	Neilke Consu
23	Travis Industries	Large Flush Hybrid Frye	ASTM E3053	<50%	<50%	OMNI	Travis Fac
24	HHT/Hearth & Home Technologies	Quadra Fire Pioneer - III	ASTM E3053	<50%	No	OMNI	??
25	Stove Builder International Inc.	and Monaco XL, WFP100	ASTM E3053	CBD	CBD	Intertek	SBI
26	Stove Builder International Inc.	2100, HT-3000, Osburn 3500,	ASTM E3053	<50%	<50%	Intertek	SBI
27	Stove Builder International Inc.	Stratford II, FP10 Lafayette II, FP12	ASTM E3053	CBD	CBD	Intertek	SBI
28	Stove Builder International Inc.	FW2900-SD, Gateway 2300, and	ASTM E3053	CBD	CBD	Intertek	SBI
29	Stove Builder International Inc.	Myriad III, Legend III, Escape 1900,	ASTM E3053	<50%	<50%	Intertek	SBI
30	Stove Builder International Inc.	Everest II, St. Clair 3000	ASTM E3053	<50%	<50%	Intertek	SBI
31	Stove Builder International Inc.	1800-I Insert, 2000 Stove, 2000-I	ASTM E3053	CBD	CBD	Intertek	SBI
32	Dovre	Lynwood W76, SBI Cape Town 1800	ASTM E3053	<50%	<50%	Danish Tech	DTI
33	Jotul	F602 v2	ASTM E3053	CBD	CBD	Polytests	Poly Lab
34	Jotul	F45 V2	ASTM E3053	CBD	CBD	Polytests	Poly Lab
35	Arada Stoves Ltd	Farringdon 12	ASTM E3053	CBD	CBD	Polytests	Poly Lab
36	United State Stove Company	CH11, NM680, SW1.2, and	ASTM E3053	CBD	CBD	Polytests	Poly Lab
37	United State Stove Company	CH18, NM690, SW1.8, AHWS1820	ASTM E3053	<50%	<50%	Polytests	Poly Lab
38	United State Stove Company	CH20, NM690, SW2.0, and	ASTM E3053	CBD	CBD	Polytests	Poly Lab
39	United State Stove Company	CH25, NM1190, SW2.5, and	ASTM E3053	<50%	<50%	Polytests	Poly Lab
40	Hussong Manufacturing Co.	Kozy Heat Z42, Kozy Heat Albany	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
41	Spartherm	S 600 ZC, Spartherm S 600 Module	ASTM E3053	CBD	CBD	Polytests	Poly Lab
42	Spartherm	M 700 ZC, Spartherm M 700 Module	ASTM E3053	CBD	CBD	Polytests	Poly Lab
43	Wolf Steel	Napoleon S20, Napoleon S20-I,	ASTM E3053	CBD	CBD	Polytests	Poly Lab
44	Morso	B	ASTM E3053	<50%	<50%	Danish Tech Ir	DTI
45	Morso Jernstoberi A/S	7110b	ASTM E3053	<50%	<50%	Danish Tech Ir	DTI
72	Hearthstone Quality Home Heating Pr	WFP100	ASTM E3053	<50%	<50%	Intertek	Hearthstone
81	Travis Industries	Medium Flush	ASTM E3053	<50%	<50%	OMNI	Neilke Consu
102	A.J. Wells and Sons	Charnwood Skye E700	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
103	England's Stoves	S0TRW06, IS-WC8, S0-SHW08, S0-	ASTM E3053	CBD	CBD	PFS-TECO	PFS Lab
104	England's Stoves	32-NC, S0-SNC32, S0-TNC32	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
105	Jotul North America	F55V2	ASTM E3053	<50%	<50%	Polytests	Poly Lab
110	New Buck Coporation	Model 74	ASTM E3053	<50%	<50%	PFS-TECO	Neilke Consu
111	New Buck Coporation	Model 91	ASTM E3053	<50%	<50%	OMNI	Neilke Consu
112	Pacific Energy Fireplaces	FP2SLE, FP2SAR LE	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
113	Pacific Energy Fireplaces	NEOSTONE 2.5 LE	ASTM E3053	<50%	<50%	PFS-TECO	PFS Lab
117	Stove Builders International	1700, Columbia II, Savannah II,	ASTM E3053	Not Reported	Not Reported	Intertek	SBI
119	United States Stove Company	AW3200E	ASTM E3053	<50%	<50%	Polytests	Poly Lab
120	HHT/Hearth and Home Technologies	Flexburn Catalytic Modal	ASTM E3053	<50%	<50%	OMNI	at VC, Bethe
121	HHT/Hearth and Home Technologies	FlexBurn Model	ASTM E3053	<50%	<50%	OMNI	
122	Woodstock Soapstone Company	202 Palladian, 204 Keystone	ASTM E3053	<50%	<50%	Polytests	Poly Lab
123	Woodstock Soapstone	205 Fireview Catalytic	ASTM E3053	<50%	<50%	Polytests	Poly Lab
124	Woodstock Soapstone Company	210 Ideal Steel	ASTM E3053	<50%	<50%	Polytests	Poly Lab
127	Stove Builders International	1.7, Solution 1.7, Osburn 1700,	ASTM E3053	Not Reported	Not Reported	Intertek	SBI
128	Morso Jernstoberi A/S	2B Standard 2020	ASTM E3053	<50%	<50%	Danish Tech Ir	DTI
129	United State Stove Company	US2941EB, VG4020, AW40E, AW40	ASTM E3053	<50%	<50%	Polytests	Poly Lab
130	Woodstock Soapstone Company	209a Progress Hybrid	ASTM E3053	<50%	<50%	Polytests	Poly Lab
131	Woodstock Soapstone Company	210a Ideal Steel Hybrid	ASTM E3053	DUPLICATE REVIEW		Polytests	Poly Lab
	Travis Industries	Large Flush Wood Insert	ASTM E3053	<50%	<50%	OMNI	Travis Fac

The ADEC reviews of "Squaring" and "Debarking" generated 89 red flags, 26 yellow flags, and 2 orange flags (117 flags total). Nearly every stove failed to conform to the method, or at least to ADEC's interpretation of the method.

I can't really leave the debarking debacle without providing some more photographs. All of these are from Woodstock Soapstone Company test reports, but I have looked at a number of test reports for stoves manufactured by other companies, and can state that these are NOT isolated accidents of interpretation; rather they are the rule.

Photos of Model 210 (reviewed earlier, twice) and flagged for "Debarking".

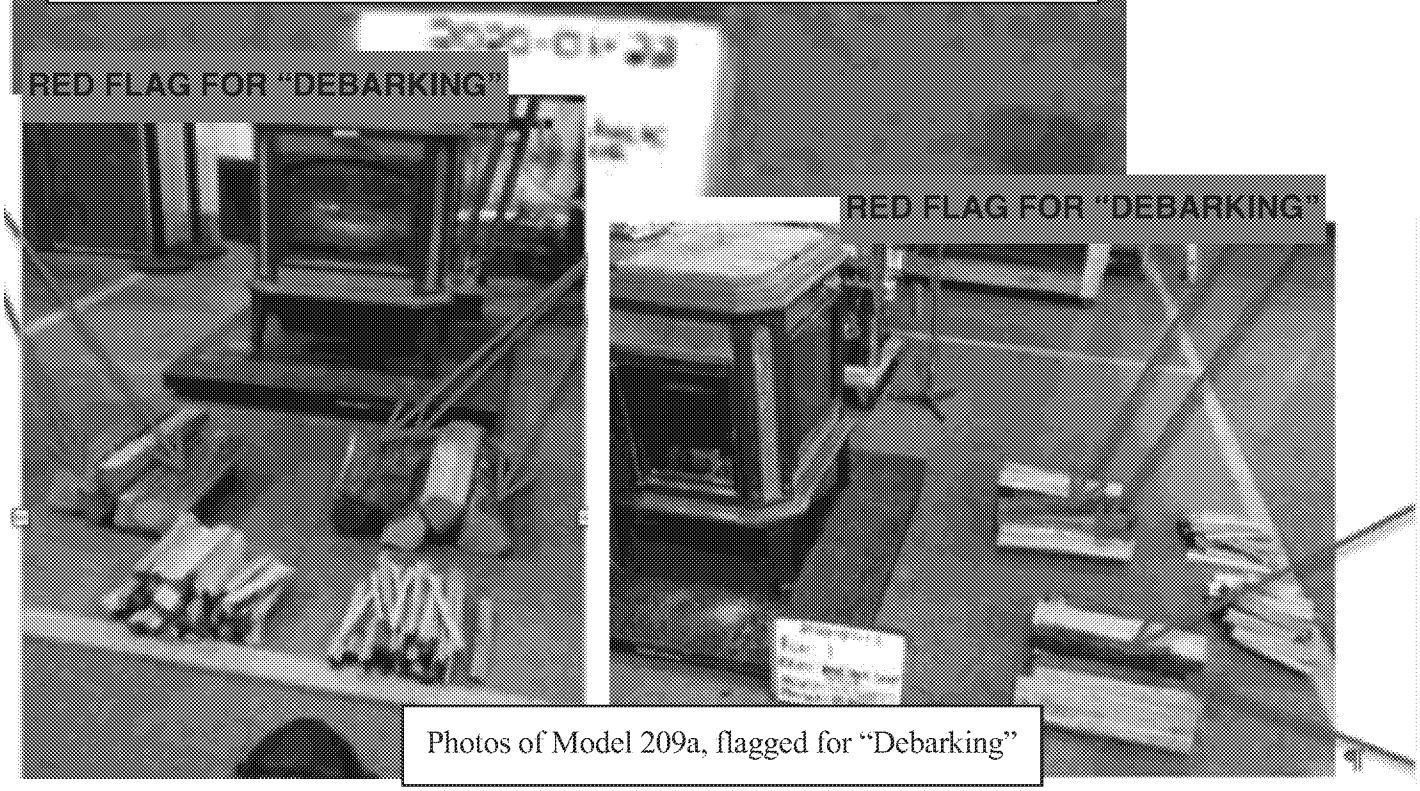


Photos of Model 205, flagged for "Debarking" AND "Squaring"

The "Assessment" claims that "90% of the stoves tested using ASTM E-3053 used debarked wood or failed to provide information about whether there was bark on the fuel." (Assessment page 38) The "Assessment further claims that "61% of the stoves tested with ASTM E-3053 used squared wood for more than 50% of the pieces" (Assessment page 33), including the stove immediately above (Model 205) and the fuel for Model 202/204, pictured on pp 10-11.

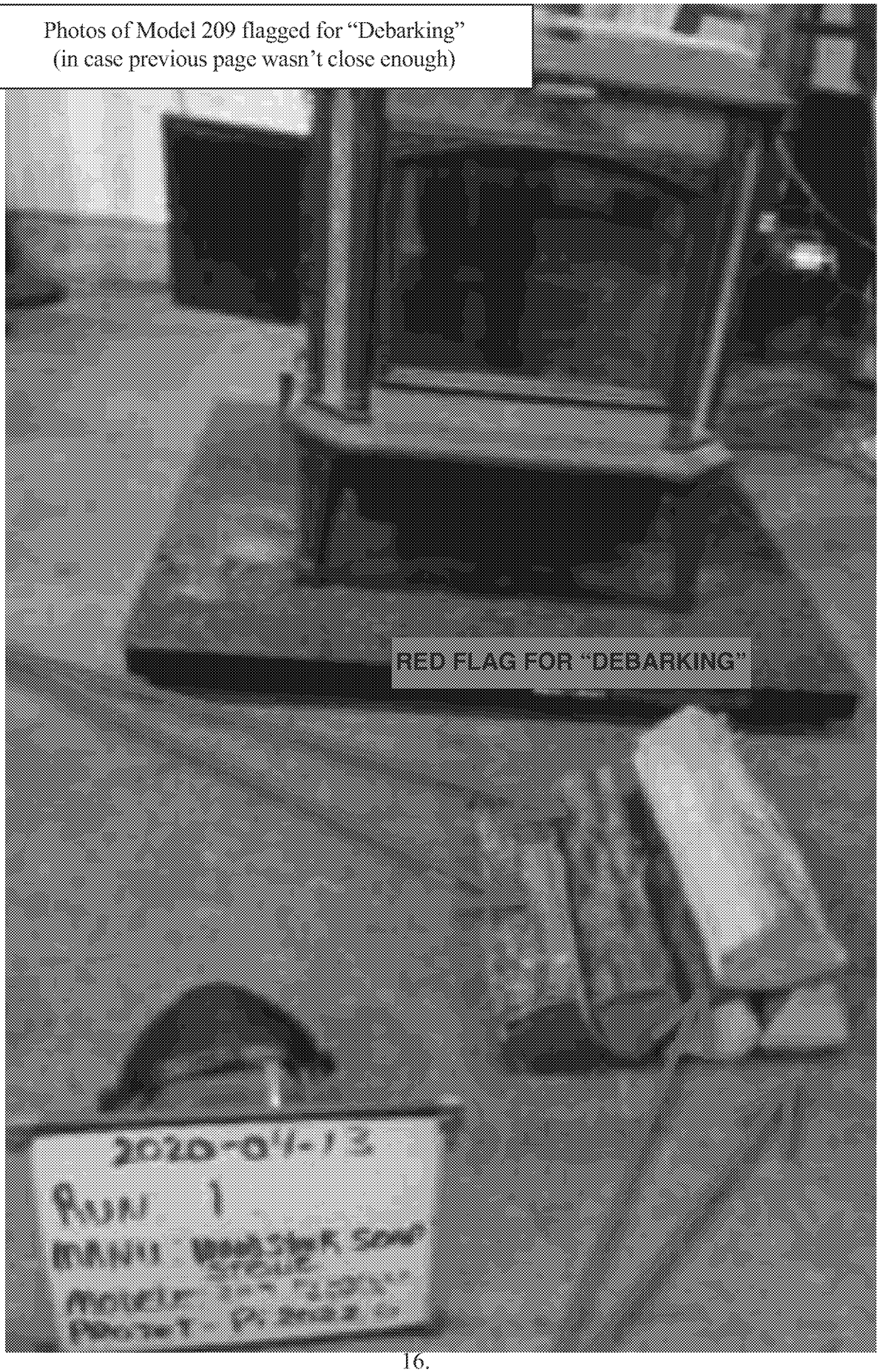
Based on my review, I cannot believe either of these claims. If the basic data underlying the "Assessment" is defective, then it's claims of numerous deficiencies in testing and reporting, and it's criticisms of ASTM E-3053 are suspect, because they are based on bad data.

Photo of Model 205, flagged for "Debarking" AND "Squaring"



Photos of Model 209a, flagged for "Debarking"

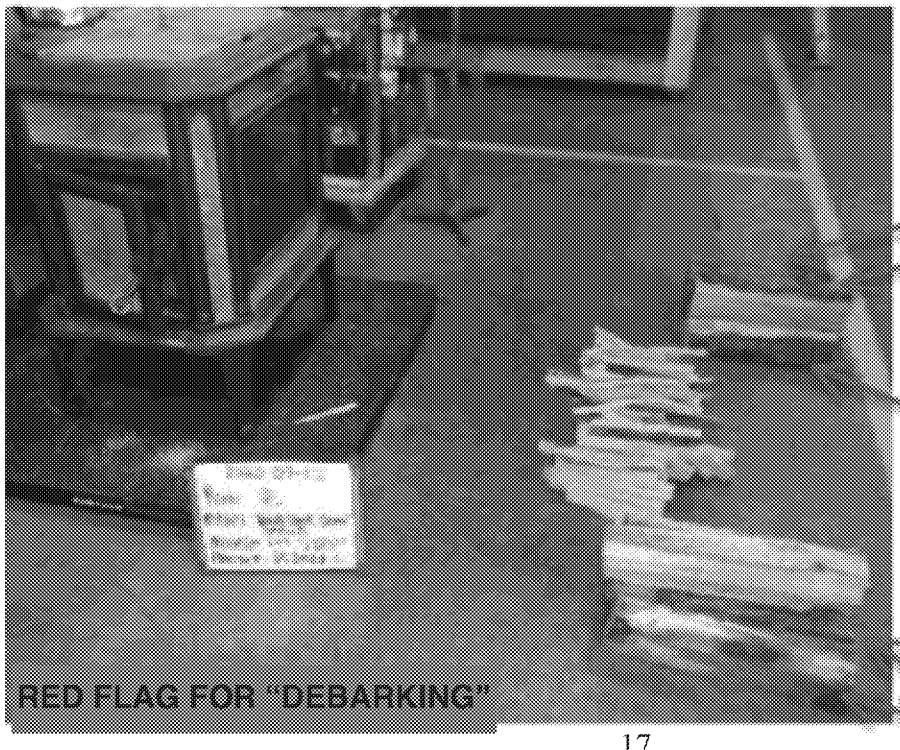
Photos of Model 209 flagged for "Debarking"
(in case previous page wasn't close enough)



Photos of Model 209a again, this time showing fuel load for day 2; medium burn load to the right of the stove (in case previous page

Run 2.1 ¶ ¶

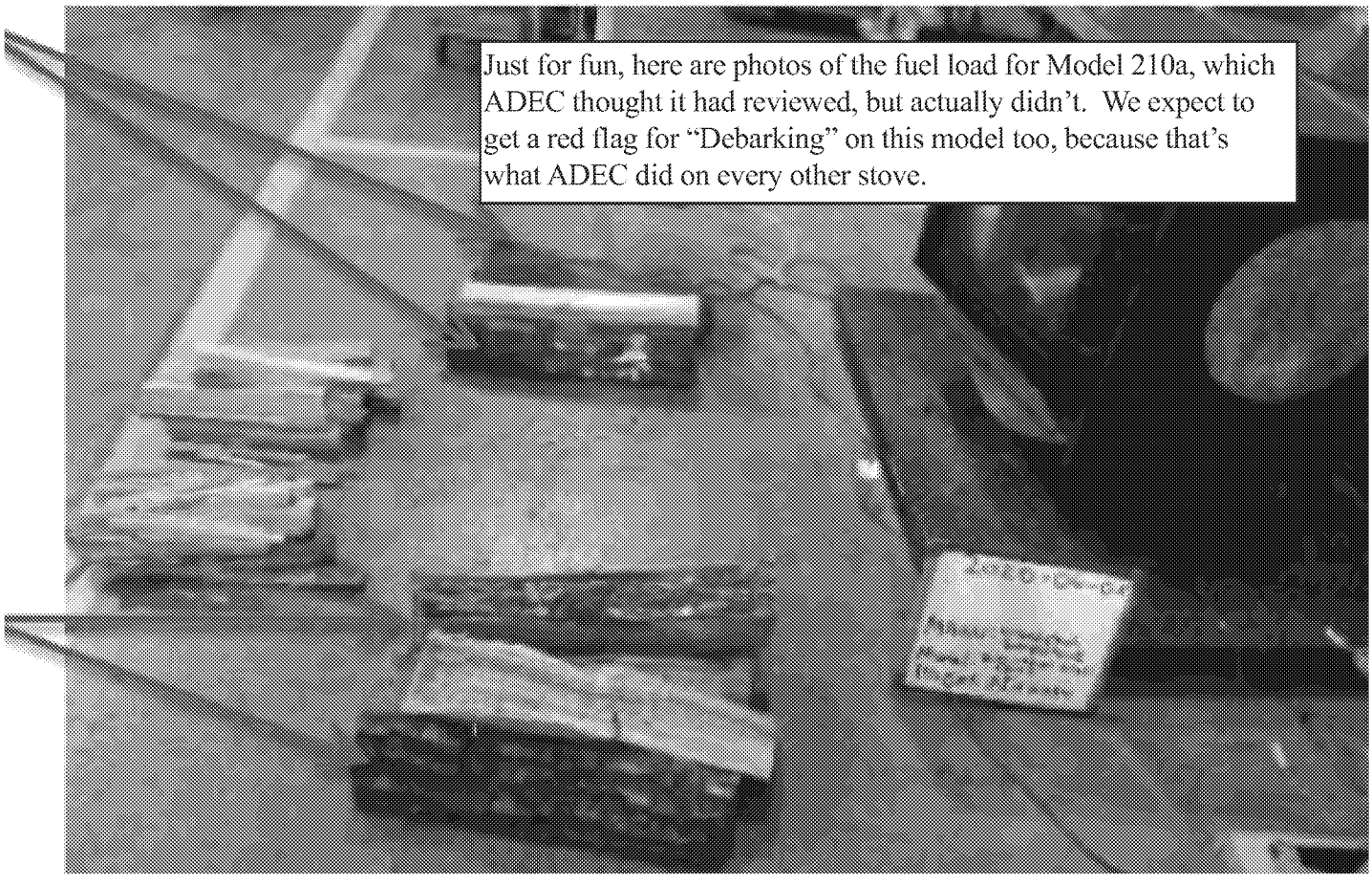
Run 2.1 ¶



¶
Run 2.1 ¶

All of the red flags pictured here, and in dozens of additional Summary Sheets compiled by ADEC, are used to discredit ASTM E-3053, and paint a negative picture of EPA, woodstove test labs, third party certifiers, and woodstove manufacturers.

These pictures are not what NESCAUM/ADEC represent them to be - i.e., evidence of tampering with test fuel by stripping off the bark and squaring it to resemble dimensional lumber. You can see it with your own eyes.



The ADEC "Decision Matrix", developed in concert with NESCAUM, identifies 6 disqualifying elements associated with the ASTM E-3053 Method. Four of these six disqualifying elements have to do with preparation and loading of the test fuel. These four pertain to 1) whether the cordwood pieces were "squared" to approximate dimensional lumber, 2) whether the cordwood pieces have been "de-barked,"3) the length of the cordwood, and 4) the direction in which the pieces are loaded. Evaluation of these 4 elements often relies on a subjective review of photographs in test reports. A fifth element has to do with: 5) whether "manufacturers used the "full firebox volume to calculate fuel volumes." The final disqualifying element is: 6) a "concern" that if the burn rate differential is less than 0.30 kg/hr between the low and medium burns, then the medium burn "is a non-representative test that impacts emission outcomes." I am not aware of any factual basis for this 6th concern.

ADEC openly states that it does not anticipate approving stoves that were tested using ASTM E-3053:

> "The highlighted devices are either devices that were tested using a method that was not referenced in the federal rule or whose certification test report deficiencies may be uncorrectable without a retest that conforms to test method and rule requirements. ADEC has not approved the alternative method used, ASTM 3053, in accordance with 18 AAC 50.077(c)(3)(iii). ***It is anticipated that these devices are expected to be removed from the approved list when their milestone date (a date given to address test report issues) expires unless the manufacturer addresses their report issues."*** (ADEC website, emphasis added)

Based on a preliminary review of ADEC's application of the 6 disqualifying elements it applies to ASTM E-3053, it appears to this reviewer that ADEC will approve few, if any, stoves tested with ASTM E-3053. But ADEC would, however, approve stoves tested with cordwood if they use the IDCTM Method developed by its partner, NESCAUM. The IDCTM is ADEC's only approved method. This is naked bias error, plain and simple.

Consistent with it's arbitrary teatment of "Squaring" and "Debarking," ADEC also established a penalty (i.e. assigment of a flag) for stoves that have a medium burn rate that is separated from their low burn rate by less than 0.30 kg/hr. ADEC makes this judgment without considering the overall relationship between low and high burn, particularly in stoves with small fireboxes. ADEC chooses a metric of kg/hr, rather than burn time or BTU output and describes its imposition of a 0.30 kg/hr separation as a "more representative" medium burn than a rate that is closer than 0.3 kg/hr to the low burn rate.

Authors of the "Assessment" are cetainly aware that for the medium burn rate on ASTM E3053, a burn that is *too high* (more than the mid-point between low and high) is punished financially by having to repeat the test again to achieve a lower burn rate. The financial incentive is to aim well under the mid-point. But in any event, the selection of 0.30 kg/hr is completely arbitrary, not required by the ASTM E-3053 method, and has no regulatory basis whatsoever.

The "Assessment claims that there is more separation between between low and medium burns on the crib method, but it also remarks that on the cordwood method stove temperatures are higher, burn times are longer, and so on. That's because *it is a different method.* Maybe the method needs to be reviewed or altered, but the "Assessment" is certainly not the way to do it.

I hope to have Part 2 in mid-June. There is a lot more to unpack in the "Assessment," including:

- The overall "Assessment" review strategy, and whether it is a credible basis for proceeding to the conclusions that the "Assessment" tries to comes to. This strategy is basically to make a list of each and every requirement imposed by the NSPS, and then see if each and every item on the list can be identified in test reports, no matter how obscure or irrelevant the requirement might be. Otherwise, deficiencies are claimed by NESCAUM/ADEC without any apparent oversight or review, or any basis in fact.

- The nexus of firebox size and calculation, loading direction, fuel length, and loading density. These are the second set of elements that the "Assessment" uses to criticize ASTM E-3053.

- I'll review this sentence, and how it has spawned innumerable "flags" (i.e., claims of violations of the NSPS) in the "Assessment"'s flag-collection effort:

"Documentation must include discussion of each test run and its appropriateness and validity, and it must include detailed discussion of all anomalies, whether all burn rate categories were achieved, any data not used in the calculations and, for any test runs not completed, the data collected during the test run and the reason(s) that the test run was not completed and why."

This single sentence has been used to generate hundreds of RED flags. The interpretation, expansion and application of this sentence, along with the multitude of flags it has generated, needs a serious review

- Once we finish looking at NESCAUM/ADEC's data collection methods and results, we can look at their statistical analysis and conclusions. Maybe in Part 3.